ELECTRICAL REVIEW

27th NOVEMBER, 1953

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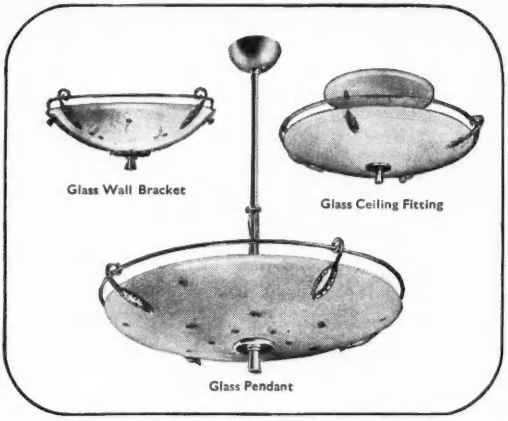
VOL. 153: No. 22
Eighty-Second Year
Fridays: Price 1/-

EDITORIAL, ADVERTISING & PUBLISHING OFFICES: Dorset House, Stamford Street, London, S.E.1. Telegraphic Address: "Elecrev, Sedist, London." Code: ABC. Telephone No. Waterloo 3333 (60 lines). Entered as Second Class Matter at the New York, U.S.A., Post Office. Annual Subscription: Home and Overseas £3 6s 0d: U.S.A. and Canada $11.00. Cheques & P.O.s (on Chief Office, London) payable to ELECTRICAL REVIEW PUBLICATIONS LTD., and crossed "Lloyds Bank."



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ELECTRICAL REVIEW 27th NOVEMBER, 1953

THE OLDEST ELECTRICAL PAPER • ESTABLISHED 1872 • VOL. 153 • NO. 22

Continuing Achievement

ADMIRATION of the achievements of the British electrical manufacturing industry was expressed by Mr. Duncan Sandys, the Minister of Supply at last week's dinner of the British Electrical and Allied Manufacturers' Association. Without undue lack of modesty the industry can accept such tributes and feel that they are deserved. Shipments of electrical goods overseas are running at the rate of 7 per cent of the country's total exports, although home demands for electrical plant for the re-equipment of practically all other industries are also being satisfied. This position has been attained by ingenuity and hard work and by the expansion and modernization of production facilities. It is true that there have been circumstances which have favoured British electrical manufacturers but it is also true that they have looked to the future and have prepared for the less propitious times which now seem to have set in. It is clear that the Government is relying upon the industry to continue its successful export career and thus play a leading role in keeping our external trade balance straight.

For its part, the industry is only too anxious to maintain and expand its overseas business but it asks the Government to do what it can to create conditions favourable to expansion and remove obstacles which stand in the way. Sir Harry Railing, president of the B.E.A.M.A., touched upon some of the matters to which attention must be paid in his reply to Mr. Sandys' speech. He placed first the need for expanding the nation's generating plant capacity by 2,000 MW a year. There are some people who question the need for this large annual increment but if we are to reach the pitch of productive efficiency attained by the United States there must be more and more industrial electrification with sufficient power plant to back it. To ensure the fullest and most economical use of this plant the load factor has to be improved and that means use for non-industrial purposes when the factories are not working. Hence the importance of encouraging the off-peak

demand represented by domestic and commercial electrification. This, as Sir Harry Railing mentioned, is also necessary as a background to export trade.

But machines are of little use without men. At the dinner Mr. D. D. Walker, chairman of the B.E.A.M.A. Council, again stressed the need for ensuring a constant supply of well-trained technologists and leaders with a wide education. Much is being done by the principal companies to encourage young men to equip themselves thoroughly for their highly technical work and the industry collectively, through the B.E.A.M.A., is actively stimulating technological education. The establishment and endowment of a Chair of Electrical Engineering in Cambridge University was an imaginative and munificent act of which the Vice-Chancellor, the Rt. Hon. H. U. Willink, expressed his appreciation at the dinner. In this and in many other ways the industry has shown recognition of its responsibility to the community of which it forms so important a part.

STRANGE DOCTRINE

Much latitude exists for differences of opinion in the matter of comparative fuel efficiencies and advocates of each class postulate their own conditions upon which to base their claims. But there are some arguments which are patently fallacious. A recent case is that in which, in a letter to *The Times*, Mr. W. F. Coxon (*Gas Times*) attempts to refute statements in the E.D.A. booklet "Facts about Fuels." Any merit which his case may have is entirely dissipated by his strange concluding point. He admits that there must be sufficient electricity for industry but considers that this "refined and costly fuel" should not be wasted on "the mundane, cooking, water heating and space heating loads." Setting aside the queer use of the epithet "mundane," we may ask how industry is to get cheap power if its comparatively short-period use is not balanced by a compensating domestic demand.

MEETING THE FUTURE

Apprehension is naturally arising as the development of atomic energy proceeds, and with some justification, but the possible revolution of ideas which it may bring about has had its counterparts in past history. Mr. H. Nimmo, the new president of the Engineers' Guild, reflects upon this situation in a message to his members. He counsels them not to fear the "chances and changes of this atomic age." He realizes that it will take man a long time to adapt himself and his institutions to this great new source of power, "but, as he does so, his need will grow of just those qualities of resolute integrity, dispassionate judgment and humane organizing ability which we chartered engineers strive to promote in ourselves."

THREATENED STRIKE

It is difficult to see what advantage will accrue to anybody from the threatened one-day strike in the engineering industry. Presumably it is meant as a gesture of disapproval of the employers' attitude towards the demand for higher wages and is modelled on Continental practice. The president of the Confederation of Shipbuilding and Engineering Unions has said that the Minister of Labour will be notified of the unions' decision "as a matter of courtesy." Presumably the Minister will endeavour to persuade the two parties to the dispute to agree to an investigation or arbitration before the strike date. It is neither in the employers' nor the workers' interest—or the country's—that there should be any loss of production at this particular time and, in any case, there must eventually be further discussion and negotiation.

Long Spark Discharges

*Terrestrial and Cosmical Leader Strokes**

By
C. E. R. BRUCE,
M.A., D.Sc., M.I.E.E., F.Inst.P.†

IN these remarks it is not proposed to discuss the short spark, as that has recently been the subject of an illuminating series of papers. In any case the aspects of the very short spark with which we have been more interested at the E.R.A. are the rate at which the potential collapses, and the nature of the ensuing discharge, on which some work has been done.

Discharges having characteristics similar to those of the electric arc are present in these gaps after times of the order of 10^{-7} second with currents of the order of 10 to 100 A, prior to which the discharge behaves substantially as a low resistance. However, my colleagues are doing that work on spark ignition and I should prefer to confine these remarks to the characteristics of the long and very long—and even the ultra-long—spark in which the discharge is initiated by a leader stroke.

The work was initiated with a view to gaining some insight into the nature of the lightning discharge and to understanding and guarding against the effects of lightning on overhead power transmission lines, as it is still the main trouble maker on systems like the British h.v. grid system. In passing, I may remark that, as a result of the clarification of the physical processes involved, we are now able to predict the average lightning experience of any power line from a knowledge of the mean isokeraunic level of the country traversed by the line, that is the number of days in a year on which thunder is heard, and of the tower footing resistance and arrangement of the phase conductors and earth wires.

We found that existing ideas about the average potential gradients required to cause these very long sparks were too large by a factor of the order of 10^2. On the contrary, ideas as to the current which flows during the leader stroke, and which is of the first importance from the practical as well as from the theoretical point of view, were too small by factors of the order of 10^3 to 10^4.[1a, b] This current reaches values of the order of hundreds or thousands of amperes, whereas it had been previously believed to be about 0·1 or 1 A.

It is a curious fact that these two quantities had already been measured, or could be deduced from measurements made some years before the theories were put forward about 1940 and stranger still that they were re-issued, so to speak, as recently as 1948.[2] It may, therefore, serve a useful purpose to refer once more to the physical conceptions to which we were led and to some of the work done since on the long spark and lightning discharges. I shall also refer to work on astrophysical electrical discharges which would appear to confirm the conclusion as to the composite nature of these long leader strokes, to which the study of the lightning leader stroke had led us.

Earlier views on these long discharges had simply assumed that the breakdown field is available between cloud charge and earth, i.e., a field of the order of 10^4 V/cm. However, observation showed that the pre-discharge field which causes lightning is, over most of the distance between the cloud charge and earth, only one or two hundred volts per cm. Furthermore, calculation of this field along the path actually taken by the lightning flash, based on the capacitance of the leader channel when just short of the earth, and the charge on it, confirmed that these small values of the order of 100 V/cm exist there also.

These considerations suggested that breakdown to a thermally ionized arc-like discharge channel is already completed

* A paper presented to the Conference on Ionization Phenomena in Discharges at the Clarendon Laboratory, Oxford, on 20th July, 1953.

† Electrical Research Association.

during the leader stroke of the discharge, so that that part already formed requires for its maintenance a gradient of the order of only 10 to 100 V/cm, namely that required to maintain an arc in air at about atmospheric pressure.

The advancing leader stroke thus represents almost a complete short circuit of that part of the gap which it bridges, so that large differences in potential are built up between it and the surrounding atmosphere. Potentials of the order of 10 million volts have in fact been recorded on overhead transmission lines struck by lightning. These potentials cause considerable corona discharge currents to flow in and from the channel. It was these currents which first explained the observation made some years earlier by Appleton and Chapman that about 30 per cent of the total change in the electric field caused by the first stroke of a lightning flash is associated with the propagation of the leader stroke.

The Corona Constant

As I regard these lateral corona currents as being of considerable importance, both in terrestrial and cosmical electrical discharges, I should like to say a word about their value. The assumption was made, [1b] and I think largely justified by the results obtained, that the corona current is proportional to the square of the difference in potential between the discharge channel and the surrounding space. This is the law found to govern corona from wires and it seemed that the physical processes going on out in the envelope of corona discharge could not be expected to know whether there was a conducting wire or a conducting discharge channel at their centre. However, the best test is the comparison between results based on this assumption and those derived from observation. The factor of proportionality between the current per unit length and the square of the potential difference we called "k," the corona constant. The most satisfactory records of the change of field caused by the leader stroke were those of Appleton and Chapman,[3] and from them k could be evaluated in terms of the pre-discharge field. Fig. 1 (reproduced by permission of the Royal Society) shows the values obtained for k corresponding to values of the pre-discharge field of the order of 100 V/cm. The value obtained in this way is thus of the same order as that found long ago in laboratory experiments by Watson on corona from wires, namely of the order of 10^{-17}. The form of the field change calculated in this way also agreed well with that actually observed (Fig. 2).

The only quantitative work carried out more recently on the leader stroke of the lightning discharge, with which I am acquainted, is that of Dr. Pierce at Cambridge (Thesis: 1950). He corroborates the general physical conception of the nature of the leader stroke just outlined—a highly conducting core surrounded by an envelope of corona discharge. However, from his records of the field changes caused by the leader stroke, Pierce arrives at values for the velocity of propagation of the leader stroke which differ by a factor of 10 from those obtained photographically by both Schonland for negative leaders and by McEachron for upward positive leaders from the Empire State building, and also from those which we had deduced from Appleton and Chapman's records of the duration of the field change caused by the leader stroke. The result is that, for k, Pierce obtains a value of 10^{-18} rather than 10^{-17}.

I would suggest as a suitable subject for research the theoretical or experimental

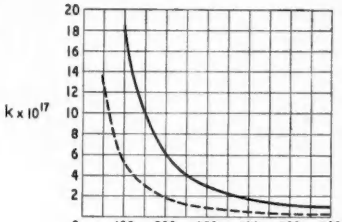


Fig. 1

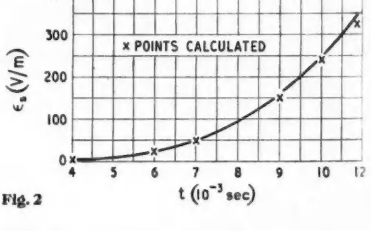


Fig. 2

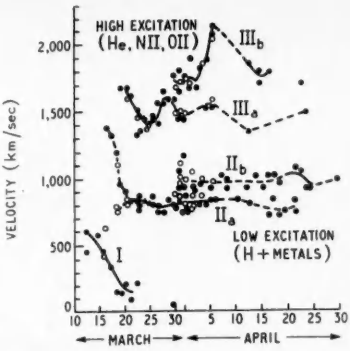


Fig. 3

investigation of this corona constant, k, which may, I think, be found to play an important role both in terrestrial and cosmical electrical discharges.

Another subject for research, I would suggest, is the condition necessary for the initiation of this, so to speak, self-propagating leader stroke of arc or arc-like discharge. There would appear to be little doubt from the experimental data already available that the pulse of corona discharge must pass some critical state, and also that this state is associated with a discharge current of the order of 0·5 or 1 A. Calculation of the rate of increase of the lateral corona current, with increase of the length of the leader, indicated that the stepped nature of the initial leader might be associated with increases of the corona current by similar amounts, and hence that each step in the leader's progress might represent a repetition of the process of initiation. However, this explanation is rendered less probable by the observation that the steps do not seem to be an essential feature of the first leader stroke, which often shows a continuous advance.

The original suggestion[1c] was that, at currents of the order of an ampere, the discharge changed over from brush or corona discharge to an arc, and as we have seen, there can be no doubt that in the final state the leader stroke of the lightning discharge is an arc discharge.

Though the precise details of this transition are still not clear, subsequent investigations on the long spark would appear to have confirmed the existence of this transition in the discharge channel from a diffuse column of corona discharge in which the electric field is still high, to one possessing the current density and potential gradient more characteristic of the thermally ionized channel of the electric arc.

Indeed, the first four major conclusions which Komelkov[4] draws from his investigation of the long laboratory spark might almost be paraphrases of our earlier conclusions as to the general nature of the breakdown process in the lightning discharge. The great increase of the lengths and potentials involved in the longer discharge more readily brought to light the general nature of the physical processes involved, and illustrates the value of extending one's interests as widely as possible.

Stellar Surface Phenomena

I should like to give another example—or what we like to think may be another example—of the value of thus enlarging one's horizons. It may stimulate interest in what we regard as an extension of the field of electrical discharges in gases, namely the study of the surface conditions in stars. The pertinence of this reference is that it would appear that, in that wider field of astrophysical phenomena, one would seem to obtain confirmation of the physical picture of the nature of these long leader strokes which occur in the breakdown of extensive atmospheric electric fields.

It has been pointed out[1d e] that there is some evidence that nova outbursts, or new stars, may represent the occurrence of electrical discharges in stellar atmospheres, which neutralize the radial electric fields built up in and with these atmospheres.

All such large discharges will have essentially the same structure, it seems to me—namely, a core of arc discharge, surrounded by an envelope of corona discharge in which, especially at lower gas pressures, the electrical excitation, or equivalent temperature, will be high.

We should thus expect two main types of spectra to be radiated from these long leader strokes, and as the Doppler shifts due to the movements of the gas, or the " thunder " of the discharge, will differ in the two regions, these two spectra may be separable.

It is interesting, therefore, that just such an association of spectra is actually observed in novæ, and Figs. 3 and 4 show the variation of the spectra during the early

stages of Nova Geminorum 1912 and Nova Aquilæ 1918. These simply show the Doppler shifts (in km/sec) against the date, and you will see that there are two quite distinct spectra in each case: that possessing the lower velocity, and consisting of the lines of H and the metals, i.e., of lower excitation, I regard as radiated from the arc-like core of the discharge (IIa and IIb of Fig. 3); while that of higher excitation and comprising the lines of neutral and ionized O and N (IIIa and IIIb of Fig. 3), I regard as being emitted by the surrounding envelope of corona discharge. It will be seen in Fig. 3 that these two spectra first became doubled simultaneously in Nova Geminorum 1912, and then again became single after many days; this would certainly seem to indicate that a very close relationship exists between the two. In Nova Aquilæ (Fig. 4) these two types of spectra successively disappeared and reappeared precisely together on nine separate occasions, possibly due to spiralling of the discharge round the central star.

Cosmic Ray Energy

If this is indeed the explanation then it will certainly be "twice blessed"—contributing to the elucidation of physical processes both in astrophysics and in discharges in gases on a terrestrial scale. It may be of interest that a recent number of the *Philosophical Magazine* contains a paper entitled "Conditions for the Occurrence of Electrical Discharges in Astrophysical Systems," so that I hope that in the comparatively near future these latter remarks of mine may not seem so out of place in Conferences on Electrical Discharges as they may have appeared to some of you on this occasion.

At Oxford, Dr. S. Whitehead inquired if the electrical discharge theory of astrophysical phenomena might contribute to the explanation of the high energies observed in cosmic rays. In reply the writer would like to add a note on an aspect of these long electrical discharges to which he drew attention in presenting a paper on leader strokes to the British Association at Belfast in 1952. It is that they act as generators of high electric fields.

It may first be recalled that, in 1925, while it was still believed that an average potential gradient of the order of 10^4 V/cm was required throughout the space between cloud and earth to cause a lightning flash, so that the potential of the cloud charge was estimated to be 10^9 V, C. T. R. Wilson suggested[5] that cosmic rays of this energy (10^9 eV) could result from the acceleration of high-speed electrons (β-particles) in these fields. Beyond a critical velocity the electron will gain more energy from the field than it loses in collisions.

Though we have seen that much lower average fields can cause a discharge, nevertheless, since the leader stroke constitutes a partial short-circuit of the space between the lower cloud charge and earth, it follows that, just before it makes contact with the earth, a large proportion of the total difference in potential between cloud and earth is concentrated across the envelope of corona discharge surrounding the leader channel. At this stage, therefore, the acceleration of high velocity electrons could occur in the manner visualized by Wilson, though the maximum energy reached would be less than his estimate by a factor of 10^2, i.e., 10^7 eV as compared with the 10^9 eV of soft cosmic rays.

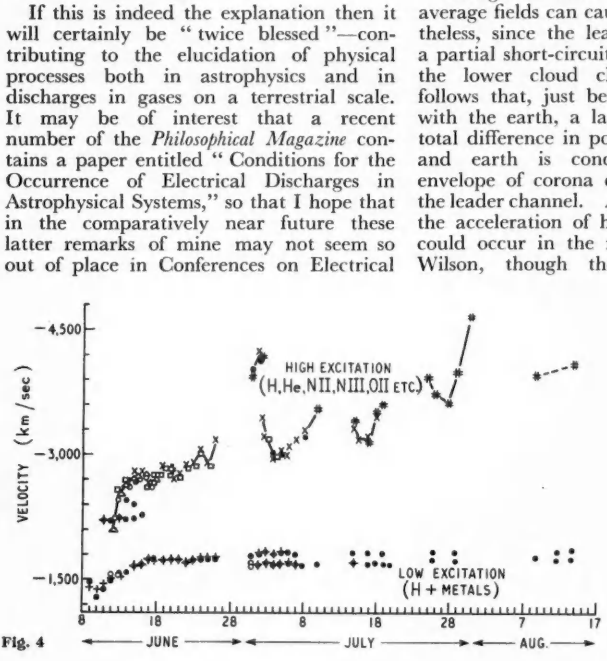


Fig. 4

However, this characteristic of field concentration will be a characteristic of all such long electrical discharges and two points may be recalled in this connection in relation to solar flares.

first, that they have been observed to be associated with sudden increases in cosmic rays of energies of about 10^9 eV and, secondly, that the writer had estimated the total potential involved in these discharges as about 10^9 eV,[1f] from the estimated potential gradient of 10^{-1} V/cm and the observed lengths of the order of 10^5 km.

Furthermore, in the original outline of the general electrical discharge view of astrophysical phenomena,[1g] the total potential drop required to cause the nova discharge referred to in the paper was estimated to be about 10^{18} V. It was later pointed out to the writer that 10^{16} to 10^{18} eV is just about the upper limit of the energy of cosmic rays. Wilson's theory of the direct acceleration of electrons in atmospheric electric fields may thus be worthy of reconsideration, but in relation to these electrical discharges in solar or stellar atmospheres.

REFERENCES

(1) Bruce, C. E. R. (a) *Jl. I.E.E.*, 1941, *88*, 487 (with R. H. Golde); (b) *Proc. Roy. Soc.* A, 1943, *183*, 228; (c) *Nature*, 1941, *147*, 805; (d) *Observatory*, 1949, *69*, 193; (e) E.R.A. Reports refs. L/T218 (1949), L/T248 (1950), Z/T85 (1952), Z/T86 (1951); (f) *Observatory*, 1949, *69*, 110; (g) "A New Approach in Astrophysics and Cosmogony," London, 1944.

(2) Loeb, L. B. *Jl. Franklin Inst.*, 1948, *246*, 123.

(3) Appleton, E. V., and Chapman, F. W. *Proc. Roy. Soc.* A, 1937, *158*, 1.

(4) Komelkov, V. (a) Doklady Akad. Nauk. U.S.S.R., 1947, *68*, 57; (b) Izv. Akad. Nauk., 1950, No. 6, p. 851.

(5) Wilson, C. T. R. *Proc. Camb. Phil. Soc.*, 1925, *22*, 534.

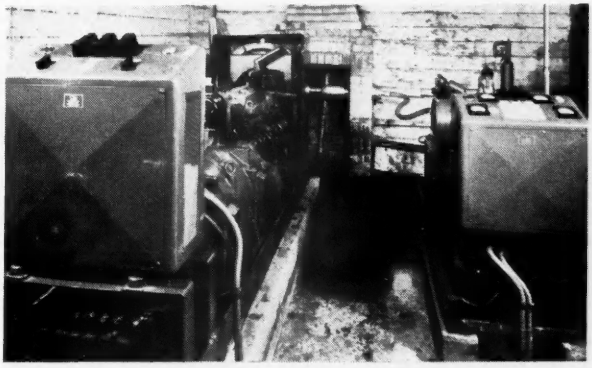
Country House Automatic Plant

Dual Installation for Peak Demand of 25 kVA

ELECTRIFICATION of a seventeenth century country house, cottages and farm buildings entailed provision for meeting a peak demand of 25 kVA, which in the absence of a mains supply necessitated the installation of a.c. generating plant. Fluctuations in the demand were increased owing to the cutting in and out of a thermostatically controlled water heater at any time during the twenty-four hours. The installation of a smaller set to deal with light loads efficiently through manual switching was ruled out since constant attendance was impracticable.

Maintenance limitations called for a simple and reliable system and the consulting architects approached Petbow, Ltd., who supplied two automatic generating sets, namely, 27·5 kVA "Condor" and 7 kVA "Falcon" generators, driven respectively by Perkins and Petter diesel engines. The plant, which has been in satisfactory operation for over a year, is shown in the accompanying illustration. The whole of the automatic gear is contained in the control panel of the smaller plant on the right. When the demand reaches 7 kVA the larger plant starts up, but the load is not transferred until the set is running steadily 10 sec later, and the change-over is practically undetectable on the lighting. The smaller set then stops until it is restarted by the load falling to 6·5 kVA, when it takes over after a short time delay and the large set shuts down.

The picture also shows the Petbow system of resilient mounting by which the generating sets are supported by runners on the ordinary floor of the barn without foundation blocks to absorb vibration.



The dual supply plant

Steel Research Laboratories

Investigations into Electrical Operation

BUILT at a cost of £500,000, new laboratories at Sheffield for the British Iron and Steel Research Association were opened by the Duke of Edinburgh on 19th November. The laboratories contain examples of most of the Association's facilities for steelmaking, mechanical working and metallurgy.

Since its inception in 1945, B.I.S.R.A.'s policy has been to follow its research investigations through vigorously to the stage of production, so that at Sheffield there is pilot machinery in which the results of research can be tried out before they are applied to full-scale production plant.

The electrical engineering activities of the Association are controlled by an Electrical Engineering Committee under the chairmanship of Mr. J. Guthrie, and its terms of reference are: "To review the present state of application of electrical engineering to the iron and steel industry and to define the present major problems and suggest methods of solution. In the light of this knowledge combined with new knowledge, the committee shall endeavour to foresee modern developments in electrical engineering, and to ensure their application in industry at the earliest possible moment." A sub-committee under Mr. W. F. Cartwright was appointed to "prepare specifications to cover the ordering of electrical overhead travelling steelworks cranes and to consider methods of improvement in their design." There is also an Electric Process Sub-Committee, whose responsibility is to investigate problems peculiar to the electric steelmaking process.

Rolling mill research supervised by the Rolling Mill Committee of the Iron and Steel Industrial Research Council was in progress when B.I.S.R.A. was set up and was taken over without interruption. Its aim is to provide accurate information about the power consumed and forces developed in rolling, in order to improve the design and operation of mills. Suitable instruments for measuring the roll force, the torque in the spindles, and the tension in the strip had first to be developed.

The rolling mill in the new labcratories was designed and built by W. H. A. Robertson, Ltd., who sub-contracted the electrical design and construction to the Metropolitan-Vickers Electrical Co., Ltd., and the electrical distribution to W. J.

Above: **The wire-drawing machine can be operated up to 5,000 ft/min**

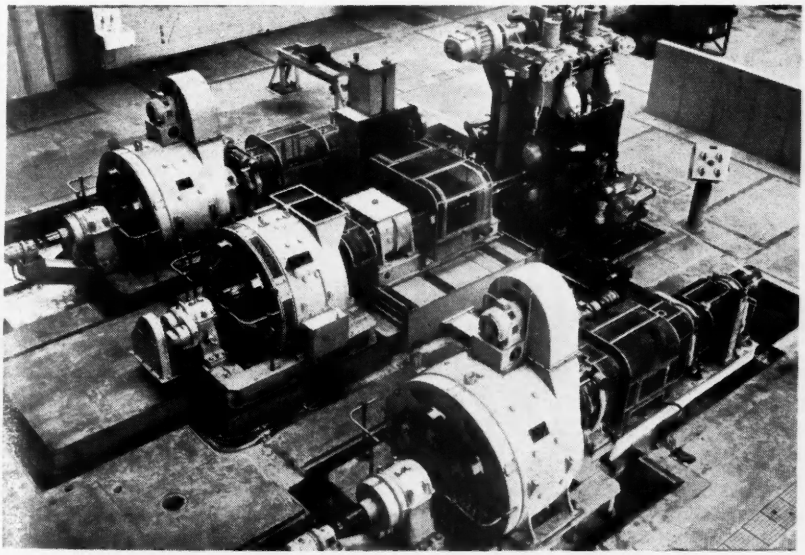
Furse & Co. (Manchester), Ltd. It is a high-speed reversible four-high cold strip mill and will accommodate work rolls of from 3·125in to 7in diameter. The main mill motor has a maximum continuous output of 750 h.p. and each coiler is equipped with a 200 h.p. motor which enables a wide range of front and back tensions to be applied. The coiler drums will take a 4 ton, 56in diameter, 12in wide coil. The two 5 h.p. screw down motors can be operated separately or together, with a total exerted pressure of 300 tons.

In order to allow as wide a field of cold rolling research as possible to be undertaken, operating conditions have been extended far beyond the normal production limits. The speed of the main motor can be varied from zero to 955 r.p.m., giving an ingoing strip speed of 0 to 1,750ft/min with 7in diameter rolls. Any given speed can be pre-set and repeated accurately within these limits, irrespective of load. The acceleration from zero to maximum speed can be pre-set between 10 and 30 sec. Back and front tensions can be applied, and for a given setting they are kept constant during acceleration, deceleration and change in coil diameter. Under normal running conditions the maximum tension available is 2 tons per side, but there is a control which will increase this by any factor up to 100 per cent. Under stalled conditions the tension is automatically reduced, but by pressing a button the running tension can be obtained for short periods. It is also possible to reel strip from one coiler to the other under full tension control with the rolls lifted.

The coiler motors are each fed from their own generator and controlled by metadynes. The latter also provide for draught adjustment up to 90 per cent, inching each coiler independently or with the mill, adjusting speeds when different diameter work rolls are fitted, and preventing the motors from overspeeding if the strip breaks. At speeds below 200ft/min the mill is controlled from a separate metadyne system which obtains a signal from a belt-driven tachogenerator on the mill motor extension shaft.

The Electrical Engineering Committee is also concerned with problems associated with the rating of mill-type motors and their application to steelworks auxiliary drives. In 1950 these problems were discussed with motor manufacturers and users and a "Motor Rating" Conference was convened. The interchange of views

The rolling mill is a high-speed reversible four-high cold strip mill with a main drive of 750 h.p.



confirmed the need for quantitative data on the alleged diverse duty cycles of motors for auxiliary drives, as a first step towards the improvement of future motor selection. In addition, suggestions were made for methods of motor rating (taking into account intermittent loading conditions) to replace the conventional one-hour rating, which was generally agreed to be unsuitable for the selection of mill motors.

A method of establishing the required rating of mill motors for auxiliary drives operating on intermittent loads is being developed jointly with Birmingham University. It requires only special characteristic heating curves for each motor, which are determined on the test bed, and a knowledge of the duty cycle. The latter information is obtained from a statistical analysis of the cycles of existing drives. At the same university a bursar is studying the more theoretical side of the thermal characteristics of motors, and arrangements have been made to have a special mill motor armature fitted with resistance thermometers and to carry out special tests.

Since 1948 B.I.S.R.A. has carried out laboratory work on wire drawing. Much of the knowledge so acquired is incorporated in the wire-drawing machine at Sheffield, which can operate at up to 5,000ft/min, and is claimed to be the fastest machine of its kind in the world. It is a two-hole, straight-line machine with a spool feed and take-up and with 18in diameter capstans mounted on vertical shafts coupled directly to the driving motors. The feed spool mechanism can be used at low speeds to make up spools from coils of wire, and a capstan can be substituted for the take-up spool for coiling.

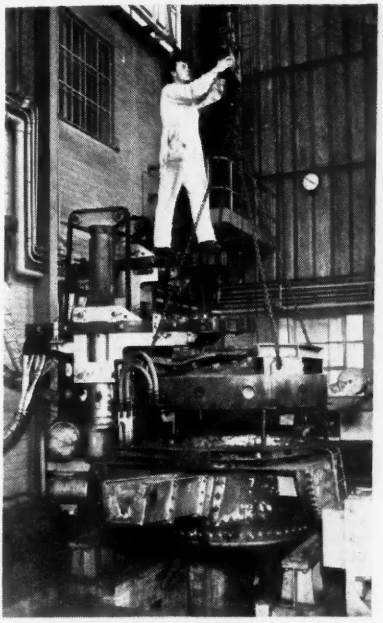
The machine can be used to draw both ferrous and non-ferrous wire of an initial diameter of between 0·040in and 0·104in under widely varying conditions. Interpass and spool tensions can be varied from zero to the breaking point of the wire. It can also be run as a slip machine, in which case the capstan motors are linked by interchangeable pulleys and belts, or as a single holer with the first die removed and the first capstan acting as a brake. The maximum inlet speed is 2,500ft/min and in an emergency it is possible to stop delivery at full speed in 2 sec under a combination of dynamic braking and twin electromagnetic braking.

In order to obtain the wide range of speed required, the d.c. motors driving the capstans and spools are supplied from a grid-controlled mercury arc rectifier by means of which a continuous variation of armature voltage can be obtained, giving continuous speed variation. High-speed control is by a rheostat in the motor field circuit, and by this system a constant torque is obtained from zero to a speed of approximately 3·5 r.p.m. per volt on the armature. The capstan motors are rated at 55 h.p. and the spool motors at 20 h.p., both at 1,000 r.p.m. A number of safety interlocks are provided in the drive, and the whole plant is automatically shut down if any motor overspeeds or exceeds the maximum voltage or current, or if the wire breaks. When the cover of the drawing compartment is open the machine can only be run at low speed. The main controls are on a desk facing the machine. They include start and stop controls for the whole of the plant, speed control of the entire plant, acceleration and deceleration rate adjustments for capstan and spool torques.

For several years the Association has been working on crane master controllers and cab design. A new shape of master controller has been developed which lends itself to the grouping of controls around the operator in a much more efficient manner than in the past. Up to seven controllers can be accommodated, and all the operating handles are arranged on a horizontal plane well within the operator's reach. Some data on the performance of prototype master controllers on various duties have already been collected. Tooling up for quantity production has been completed and forty controllers ordered by six different steelworks managements are nearly finished.

Since duty cycles are seldom definable in steelworks, performance tests of acceleration and speeds are laid down in the Association's specification. The metalworking shop at the new Sheffield laboratories is served by a 10-ton crane whose cab design incorporates parts to this crane specification. It is used for hoisting steel coils from storage in the main block basement and lifting the substation transformers when required.

The principal equipment in the melting shop is a 10 cwt arc furnace supplied by the Electric Furnace Co., Ltd. The work so far carried out with this furnace has been mainly concerned with the effects of a number of variables on power and electrode consumption, the aim being to reduce



The principal equipment in the melting shop is the 10 cwt 500 kVA arc furnace

operating costs and so widen the range of steels over which the arc furnace can compete with the open hearth. The biggest effect so far found is that of the rate of power input during melting down. The furnace transformer, supplied by Metropolitan-Vickers, is of 500 kVA nominal capacity, and is larger than would normally be used for a 10 cwt furnace, in order that the effects of high power input rates might be investigated. It has eight voltage tappings ranging from 64 to 180 V. About 20 per cent less power is required with the load and corresponding input rate of 500 kVA than with similar conditions at the 250 kVA rating.

Since 1925 steam conditions for turbines have increased to, say, 1,050 deg F and 1,500 lb/sq in, and suitable steels to withstand these conditions have had to be developed. In order that the designer may make the most economical use of steels he must be provided with data regarding their likely performance under varying conditions, and creep tests are therefore carried out where steels are subjected to stress for long periods at high temperatures. From a series of such tests the behaviour of steels under service conditions in power plants can be estimated. This work is being carried out by the British Electrical and Allied Industries Research Association, the National Physical Laboratory, and the B.I.S.R.A.

During the last fifty years electrical sheet has been so improved that transformers have been halved in physical size for a given output; so great has been this improvement that further progress is even more arduous and difficult. In working on this subject B.I.S.R.A. has therefore to consider the effects of very small amounts of impurities, e.g., 0·0001 per cent of nitrogen. For this reason a high vacuum melting furnace has been installed in which steel can be melted in conditions where the precise amounts of impurities can be controlled and their effects gauged. This furnace is designed to operate at a pressure of 0·0001 mm of mercury.

An interesting feature of the laboratories is the housing of the services. For example, the floor of the metalworking shop incorporates a network of trenches or ducts, two of which run the whole length of the building immediately inside the walls and are connected together by two further limbs running across the width of the shop. These four main ducts have removable concrete slab covers and are connected with the duct network extensions to other buildings. They are provided with built-in lighting and can be entered from the electrical substation, the longitudinal ones being large enough for maintenance men to walk through them.

It is also noteworthy that the mill motor generator set is cooled by forcing cold air from a small pressurized basement through holes in its foundation and into the machines. The warmed air then exhausts into the motor generator room and escapes into the main duct system, thus combating dampness in the tunnels.

St. Dunstan's

The work of St. Dunstan's on behalf of blinded ex-service men is well known, and its report for the year ended 31st March last, now issued, shows how its work has expanded. Entitled "From Mons to Korea—and After," it traces the history of the organization, with numerous pictures showing its work of rehabilitation, training and welfare.

Carbon Brushes

Rate of Wear at High Altitudes

REASONS for possible sudden increase in wear of carbon brushes used for generators on aircraft from a normal figure between 0·0001 and 0·001 in/hr to between 0·01 and 0·02 in/min at 30,000ft were discussed by Mr. R. F. Sims (Royal Aircraft Establishment) in a paper presented on 19th November before the Institution of Electrical Engineers, Utilization Section. Wear of the commutator or slip-ring was also rapid—in one experiment one-tenth of the volume of the carbon removed. The problem appeared to be mechanical rather than electrical and independent of the current flowing. At high altitudes, where the atmosphere was very dry, wear rate of carbon brushes, which depended on atmospheric water, became catastrophic. Inorganic lubricants which produced a stable film on a commutator surface adversely affected machine performance. Treated brushes should not be employed except for high-altitude aircraft and sparking must be avoided by, for example, full armature compensation and interpoles. Allowance must be made for greater temperature rise.

DISCUSSION

The discussion was opened by Mr. R. H. Woodall (Rotex) who doubted whether, without the work of the author and his colleagues, current types of aircraft could successfully fly at high altitudes. D.c. was still used in aircraft, but with increasing altitudes the constant frequency alternator might prove best. A more positive method of judging sparkless commutation was needed. Some quantitative measurement by a radio interference check, if practicable, would enable manufacturers to work to the same commutation criteria for high altitudes.

Mr. B. J. Elkins (British European Airways Corporation) said that brushes on the Dakota, the forerunner of the Viscount, were worn out in 30 hours, whereas it took 40 hours to bed them in. The treated brush had a calculated life of at least 1,000 hours.

Mr. J. G. Carr (R.A.E., Farnborough) showed photomicrographs of slip-rings and brushes at various stages which appeared to indicate that the very high rate of wear, once seizure had occurred, was largely due to abrasion of the brush by projections of work-hardened copper raised on the slip-ring surface.

Mr. M. Vaughan (Morgan Crucible Co.) submitted that neither Savage's theory of an adsorbed film of water vapour nor Elsey's theory of water acting as a catalyst in promoting the formation of an oxide film accounted entirely for all the observed facts. Good and stable contact with the commutator was required and, to avoid high altitude wear, the brush must contain something to make it deposit a tenacious film—two incompatible requirements which suggested the need for an entirely different approach to the problem.

Mr. J. F. Lewis (Ministry of Supply) said that generators had in the past been designed before the new type brushes were available. Designs of generators more suitable for adjuvant treated brushes might be expected when the brushes were available from the start.

Mr. B. R. Atkins referred to the development of a brush embodying a skeletal structure of a material which operated as an auxiliary bearing component not susceptible to the same breakdown under altitude conditions as was graphite. Using a bell jar chamber, he had produced brushes to withstand simulated altitude conditions up to 80,000ft without film formation.

Wing-Commander H. J. Irens said that the R.A.F. had had very little trouble with high altitude brush wear on generators during the last year, and in the New Zealand air race the Canberras got to New Zealand without any trouble. However, there had been considerable trouble with invertors, which was more a matter of commutator design than of the brushes themselves.

Others taking part in the discussion were Messrs. I. A. Mossop, J. R. De C. Bower, T. J. Anderson, A. G. Pearce and D. B. Hogg.

Power Factor Measurement

A Simplified Approach

By R. L. MARRS, B.Sc.

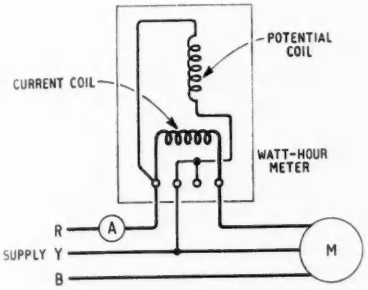


Fig. 1

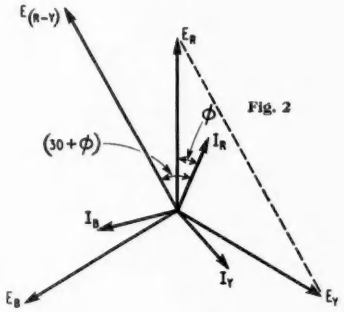


Fig. 2

THE following method has been derived because of the need for a simple means of obtaining the power factor of a motor driving a production machine, with the minimum of instrument connections and with apparatus well within the scope of the average works engineer. It has been assumed that the load is three-phase and balanced and that the power factor of each phase is the same, these being usually true for induction motor loads. For the purpose of plotting the graph (Fig. 3) a line voltage of 400 V has been assumed, but a similar curve can be obtained for any voltage.

The apparatus required consists of an ammeter and a single-phase, house-service watt-hour meter, both of ratings suitable for the load whose power factor is to be measured, and with the potential coil of the latter rated at the line voltage of the supply.

For an understanding of the theory underlying the method of measurement reference should be to Figs. 1 and 2. Now let $E_{(R-Y)}$ = line voltage of supply (red to yellow), I_R = phase current (red phase), N = speed of watt-hour meter disc in r.p.m., K = revolutions per kWh as indicated on the nameplate of the watt-hour

Fig. 1.—Basic circuit for power factor measurement

Fig. 2.—Vector diagram for a balanced three-phase load

Fig. 3.—Graph of $\frac{N}{I}$ against power factor for two different sizes of kWh meter

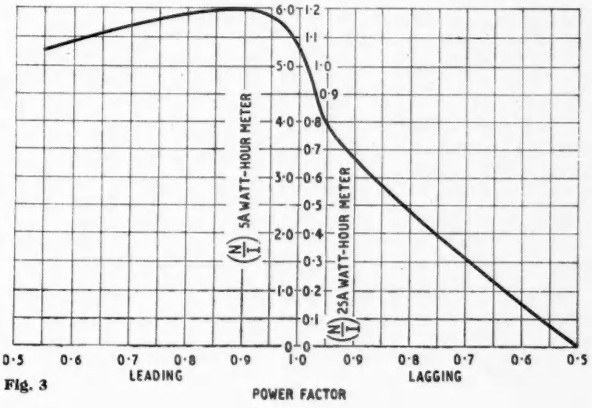


Fig. 3

meter, and cos ϕ = power factor to be measured.

Thus the power in kW measured by watt-hour meter

$$= \frac{E_{(R-Y)} . I_R \cos (30 + \phi)}{1000} = \frac{N \times 60}{K}$$

Therefore $$\frac{N}{I_R} = \frac{K . E_{(R-Y)} . \cos (30 + \phi)}{60 \times 1000}$$

Assuming $E_{(R-Y)} = 400$ V, then:

For a 5 A watt-hour meter with K = 900 r/kWh

$$\frac{N}{I_R} = 6 \cos (30 + \phi) \quad \ldots\ldots\ldots (1)$$

For a 25 A watt-hour meter with K = 180 r/kWh

$$\frac{N}{I_R} = 1{\cdot}2 \cos (30 + \phi) \quad \ldots\ldots\ldots (2)$$

By substituting various values of ϕ in equations (1) and (2) and plotting the ratio N/I_R against cos ϕ, curves similar to those in Fig. 3 can be obtained.

It is therefore obvious that by connecting the two instruments as shown and by dividing the r.p.m. of the disc by the current as measured, an immediate indication of the power factor is obtained.

This is a simplification of the two watt-meter method and can be applied to the power factor measurement of any balanced three-phase load when a neutral connection is not available. It also has the advantages that it is obvious whether the power factor is leading or lagging and that to a certain extent reversed electrical connections do not affect the ultimate result. For most loads it will be found that this method is reasonably accurate and the simple connections make the survey work for a power factor correction scheme more rapid.

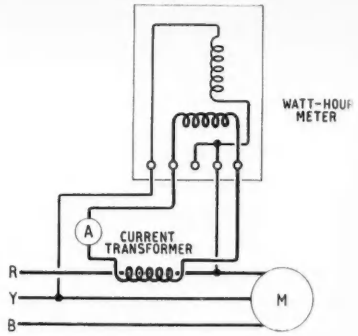


Fig. 4.—Method of connection when using a current transformer

Rather than have a range of instruments suitable for various loads it would be more practical to use a current transformer with a selection of ratios, together with 5 A instruments. The tong type of current transformer, although convenient for this kind of work, is to be avoided where possible on account of the usual errors accompanying these transformers.

To use a current transformer it will be necessary to disconnect the potential coil from the current coil in the watt-hour meter. With the better makes this can easily be done by means of a testing link usually provided. The diagram of connections is shown in Fig. 4.

Coal-Mining Apprenticeships

AN apprenticeship scheme to provide the coal industry with the properly-trained mechanical and electrical engineering craftsmen it needs is being introduced by the National Coal Board. The scheme, which provides a co-ordinated course of progressive practical training and technical education lasting five years, has been agreed with the National Union of Mineworkers, who are also represented on the committees which will advise on the operation of the scheme in each area, interview candidates and recommend boys for apprenticeships. No premium will be charged and the apprentice will receive wages at rates fixed by the Joint National Negotiating Committee of the Board and Union. There will be part-time day release from work, with pay, on one or two half-days a week, the Board paying all fees for approved technical education, travelling expenses and lodging allowance where applicable. The training syllabuses have been drawn up in agreement with the appropriate professional bodies. Apprenticeship is open to boys already working in the industry and to boys outside.

The intake into the scheme will be governed by the need to maintain the industry's complement of qualified craftsmen and each Coal Board Division will estimate its requirements at least once a year and decide the number of apprentices of each kind to be taken on by each area. Vacancies will be notified at the collieries, workshops and other N.C.B. undertakings, youth employment offices, technical colleges and other appropriate places.

Fuel and Power Economy

National Policy Discussed

MEASURES for securing immediate and sustained economy in the use of Britain's fuel and power resources as a basis for a national fuel policy formed the theme of a paper presented to the Institute of Fuel on 24th November by Dr. F. M. H. Taylor. There was, he said, a need to preserve a balance between supplies of solid smokeless fuel, oil, electricity and gas, having regard both to the present and potential demands and to the production facilities available. Information summarized from many authoritative sources endorsed the findings of the Ridley Committee. Application of each recommendation would depend upon the Government's whole economic policy and must be gradual and allow for its own secondary effects.

Coal Exports

The economic background he described as one in which production and export of goods and services fell short by at least £300 million a year of what was required for this country to pay its way and play an adequate part in Commonwealth and Empire development. In 1952 coal exports of 11·75 million tons were valued at £55 million; at the 1938 level of 35 million tons, a further £100 million would have been gained. Commercially workable coal would last for only about 250 years at an annual production rate of 250 million tons. Coal, which now supplied nearly 90 per cent of fuel and energy in the United Kingdom, would continue to be the main source in the foreseeable future. Imported oil accounted for 10 per cent of the total, including transport, but the export of products of petroleum refineries, a new departure, amounted to nearly as much in value as coal exports.

The National Coal Board hoped to produce 260 million tons of coal per annum in 1961–1965, but home requirements would then be 235 million tons and exports between 25 and 35 million tons. In 1952 213 million tons of deep-mined coal were raised with an ash content 3 to 6 per cent greater than in 1938 when the total was 227 million tons, although mechanized output had increased from 50 to 85 per cent. Without the addition of 11 million tons of open-cast coal, exports could not have been maintained even at the low level of last year. The potential deficit ten years hence would be over 10 million tons.

Coal used as such in homes to-day came to 38 million tons compared with 50 million in 1938, but increased use of electricity and gas brought the total to the equivalent of about 60 million tons in both years. Solid smokeless fuel (mainly graded gas coke) he regarded as the most desirable means of providing basic domestic heating and hot water, but higher efficiency would not necessarily result in equivalent fuel saving as much of any gain would go towards increasing comfort. Fuel consumption largely depended on the householder's habits and Government direction on technical grounds was a poor substitute for the consumer's purse, provided prices were closely related to costs of production and distribution.

Electricity Expansion

Expansion of the use of electricity for domestic purposes had raised the load factor of electricity supply undertakings, thus stabilizing prices for industry. The major fuel industries and fuel consuming industries, which included the Coal Board, electricity and gas and the railways and iron and steel industries, used between them 120 million tons of coal a year.

The gas turbine in conjunction with the steam cycle might raise the thermal efficiency of electric power stations (now approaching 35 per cent as a maximum) to between 40 and 50 per cent, while the 275 kV supergrid would facilitate the fuller loading of the more efficient plants. These developments would nearly halve the amount of coal required per kWh generated.

On the railways the quickest return could be obtained by substituting diesel for steam shunting engines, the latter having an overall efficiency of only 2 to 3 per cent. More extensive diesel general service

traction developments had been limited by capital deficiency. Five gas-turbine locomotives had now been completed. Size and weight for equal output and maintenance were less than for steam, while their higher availability substantially balanced their three to one comparison in capital cost. The coal equivalent of the fuel oil used was one-third of that required for steam locomotives, but this saving was largely offset by the higher cost of the fuel.

The Coal Board, which had itself reduced the amount of coal consumed per ton of output from 147 lb in 1947 to 125 lb in 1952, had had to devote its allocation of £500 million to production machinery rather than to equipment for economizing fuel utilization. The author advocated the steering of capital in this and other nationalized undertakings into those channels which promised the quickest beneficial results and the largest fuel savings.

Thus steady expansion of electricity and gas was desirable in relation to the damage caused by smoke and fog. As the Coal Board, by fixing the price of coal to these two industries (its active competitors), could control their economic development, it was considered that the price structure of coal should be subject to independent supervision.

Minimum Home Office standards of heating, determined by air temperature, called for revision. Every 1 deg F above that needed for comfort added 4 to 5 per cent to fuel consumption. The economic failure of district heating in Great Britain indicated its unsuitability for municipal housing schemes. Savings of about 20 per cent could be made in fuel used by industry, which in 1951 consumed 75 million tons of coal and coke and 34 million (equivalent) tons as electricity, gas and oil. The numerous suggestions made for improvement were non-electrical except for a reference to back-pressure generation. The need for careful review of the economics of any proposed scheme was exemplified by reference to the fall in turbine efficiency with increasing back pressure. Far-reaching results were expected from the expansion of fuel and power efficiency services based on audits. The need for incentives to fuel saving was illustrated by the statement that the fuel bill of the normal commercial or industrial establishment was often less than 1 per cent of its total expenditure. Many aspects of the Ridley Report were also discussed.

Electricity in Agriculture

AT a meeting of the Association of Supervising Electrical Engineers in London last week Mr. F. E. Rowland (G.E.C.) gave a lecture on electrical developments in horticulture. He said that in July, 1952, there were about 4,000 acres of heated commercial glasshouses in England and Wales, with a further 701 acres of unheated glasshouses, frames, bells and cloches. It was estimated that there existed here a potential electrical load of nearly 700 MW, with a consumption of about 775 million kWh.

The value of horticultural production in England and Wales in the year ended June, 1952 was £114 million, which was only about 53 per cent of the total requirements, the balance being made up by imports. There was, therefore, ample scope for expansion in home production and this could be assisted by increasing the use of electrical methods. Lighting, although taken for granted, could extend the working hours in glasshouses and packing sheds, thereby preventing the loss of paid time which might occur if work ceased at dusk.

Mr. Rowland then dealt briefly with water pumping systems and in particular with the automatic pressure water system. A typical installation comprised a 25 h.p. motor driving a multi-stage pump which had an output of 11,000 gall/hr at 135 lb/sq in. This served about 70 acres of overhead line or 2 acres of spray, with 3,000 gall/hr for glasshouse watering.

The speaker then passed on to hot water space heating systems, which could now be operated more efficiently by introducing accelerators or circulating pumps, automatic stokers and forced draught fans. Purely electrical methods of heating were then treated in some detail and the lecture concluded with an indication of some of the possible future developments of electrical methods in glasshouse culture including the control of environmental factors such as soil composition, moisture content and temperature, as well as air temperature, relative humidity, carbon dioxide content, and light energy and quantity.

CORRESPONDENCE

Letters should bear the writers' names and addresses, not necessarily for publication. Responsibility cannot be accepted for the opinions expressed by correspondents.

Electricity from Atomic Power

REFERENCES to the use of atomic power crop up frequently, with widely varying guesses as to when it will become a practical possibility to use the new form of power for the generation of electricity. So far power station engineers have been very cautious in their approach to the problem. It has taken thirty years or so to achieve a thermal efficiency of roughly 30 per cent in the best power stations, and to do this high steam pressures and temperatures have had to be employed.

Since the electricity supplier must maintain a continuous supply at all times, he must be certain that his plant is proved and reliable. The present stations using coal as fuel are smoothly and easily regulated and the present boiler plant is easily and smoothly put on and taken off load. But electricity demand varies widely during some parts of the day and at week-ends.

The first thing therefore that the power station engineer asks is: will the atomic pile have the same versatility? Can it be easily " ignited," can it be regulated over a wide range of loads, and " banked " if required? Can it be shut down quickly in case of emergency? How is it proposed to " fire " or " feed " it, and what happens to the fission material when it is spent?

So far it would appear that the heat from the piles is transferred at relatively low temperatures. In most coal-fired boilers most of the steam is generated by radiant heat transfer but if gases used for heat transfer purposes leave a pile at, say, 650 deg F, and return to the pile at, say, 350 deg F, then the amount of heating surface required in the boiler or heat exchanger will be enormous. Further, these low temperatures appear to be a retrograde step since the operating pressure and temperature of steam supplied to turbines will be much lower, and the thermodynamic efficiency of the turbine cycle will be much lower.

It might be argued that since, with a breeder pile, a negligible quantity of new fuel is used, this does not matter. It should be noted, however, that it makes a big difference to the electrical output obtainable. Physicists may refer to atomic piles in terms of 350 MW, but if the thermal efficiency of the steam cycle is only 10 per cent, then the electrical output is only 35 MW.

So far the application of atomic energy seems to have been in the hands of the physicists, but sooner or later the power station engineer must be brought more into the picture in applying atomic energy to power production. One cannot help feeling, however, that using atomic energy to replace the boiler fuel is only a " curtain raiser " to greater things, and that sooner or later an " atomic Faraday " will arise who will discover another means of bringing about the atomic disturbance we know as electricity without the use of fission, boilers and turbine plant.

C. H. FIELDING, B.SC. TECH.

Dalmuir, Glasgow.

Electric Traction Considerations

IN my recent article " Water Heating Prospects " which appeared in the *Electrical Review* of 23rd October, I mentioned the fact that increased selling activity in electric water heating would do much to recover lost traction loads in this country. In case any reader may be tempted to take a complacent view of the loss of traction supply may I point out that no amount of success in selling electricity for water heating will compensate the British electrical industry for the loss of its worldwide prestige as manufacturers of electric street traction equipment.

The sale of trolley-bus equipment abroad, for example, is not helped when our would-be customers find that our own transport authorities do not appear to support the policy of using home produced fuel for street traction.

It is the duty of everyone in the electrical industry to uphold this good cause so that

it does not suffer by default. It is no use leaving this to the other man—as ratepayers and transport users we each of us have a voice in tram scrapping decisions. To keep the price of electricity at present levels *more* load is required. The loss of 30 to 40 million kWh per year which represents the consumption of only one large tramway system is a serious matter.

London, W.C.2. PHILIP HONEY.

Electrical Work in Burma

AFTER six months as Government Electrical Inspector I am pleased to tell you that for the first time the licensing of electrical contractors and the registration of wiremen have now been established. The number of contractors licensed is 51 and 219 wiremen have been registered.

All contractors and wiremen have been warned that if their work falls below the standards laid down in the Burma Electricity Manual licences may be withdrawn and wiremen have been told that they may not work except under the supervision of a competent person.

J. A. HILL, M.A.S.E.E.

Rangoon, Burma.

Selling Electric Cookers

THE writers of this article in your issue of 16th October ask why the gas industry makes so many more sales of cookers than the electrical industry. In my opinion some of the reasons are not far to seek.

For a price of around £27–30, which suits the average small family to-day, the housewife gets a gas cooker which has four burners, thus enabling her to employ four separate pans for cooking at the same time. For the same price, its rival has one or at the most two hotplates and a grill-boiler. The latter cannot be said to be large enough to accommodate two saucepans. In addition, the inside measurements of the gas oven are considerably larger than the electric.

The average housewife to-day is generally far too busy to spend half a day at an electricity showroom, and most women require extensive tuition in how to use an electric cooker to the best advantage.

The housewife who has always used gas, when buying a new cooker, naturally keeps to gas. In my own case, some years ago I changed from electric to gas cooking, with a consequent heavy reduction in the cooking bill. I am ready to concede that since that time there have been improvements in electric cookers, but submit that they still have a long way to go to compete on equal terms with their gas rivals.

Manchester, 20. F. B. PAGET

I SHOULD like to add a personal experience to Mr. Davies's strictures on the Electricity Boards' cooker selling methods (*Electrical Review*, 13th November).

I recently went to my local electricity showrooms to buy a cooker on the hire-purchase system. The model I wanted was available, but with the wrong type of hob, and I was told that it would be a month before it could be changed. As this meant that I would be without a cooker for a week, I agreed to hire one, but quickly changed my mind when I discovered that I was to be charged £1 for one week's hire. I was left with no alternative but to take the cooker with the existing hob.

It took me a few minutes to fill in the hire-purchase agreement, but it took the Board one hour to complete the agreement and settle hire-purchase terms. If I were not an electric cooker enthusiast I should certainly have taken the easy way out and bought a gas cooker.

HOUSEWIFE.

Sheffield Arc Furnace

IN the 20th March, 1953, issue of the *Electrical Review* there appears an article entitled "Large Electrode Furnace." As furnace makers of considerable experience over many years we have read this with great interest but find that it contains statements with which we are not in agreement. Reference is made to the fact that the furnace roof is suspended at four points from two structural steel beams, an arrangement incorporated for the first time on the 20 ton furnace described. Siemens & Halske, Germany, employed four-point roof suspension over 20 years ago and regularly used it on furnaces from the smallest to those even larger than 20 ton capacity. Siemens furnaces with four-point roof suspension, are, in fact, in constant use in England where, among others, three 20 ton furnaces are installed at the works of the Brymbo Steel Co., Ltd., at Wrexham.

It is also stated that the 6,000 kVA Parsons transformer has eight secondary tappings by which "on-load" tap-changing

is effected. This is not so, as the equipment in question is designed for "off-load" tap-changing, although as a matter of convenience an on-load type of tap-changer is installed. A further quotation from the article states ". . . an interlocking relay ensures that the breaker trips whenever the transformer tap-changer operates . . .", a clear indication that the furnace is not designed for on-load tap-changing.

Hence, it is misleading to refer to the tap-changer as "on-load." On the other hand, on-load tap-changing is a feature of nearly all modern furnaces of our make. The most distinct advantages are that on account of the larger number of tappings close furnace control is possible and, as there is no interruption of the furnace input, the power lines, heavily loaded as they are nowadays, are not subject to heavy surges of current whenever tap-changing occurs. For these reasons on-load tap-changing enjoys preference in this country.

Our company are the successors to the Department of Electro-Chemistry of the Siemens & Halske A.G. and operate in England through our representatives, D.M.M. (Machinery), Ltd.

DEMAG-ELEKTROMETALLURGIE G.M.B.H.
Karlsruhe, Germany.

[We invited Birlec, Ltd., makers of the Sheffield furnace referred to, who supplied us with the information, to reply to the above letter and have received the following statement.—Editors, *Electrical Review.*]

WE would like to make the following points which, we hope, will clarify the matter for your readers.

Four-point roof suspension: The statement "This is believed to be the first case in which 'four-point roof suspension' has been adopted for British arc furnaces of such large capacity as 20 tons" is misleading when read out of its context which immediately follows with the description of the furnace as being of swing-aside roof operation. The Brymbo furnaces, referred to in Demag's letter, are of the gantry-roof type and there must obviously be greater engineering skill and experience embodied in the construction of a furnace roof, with four-point roof suspension, when it swings through over 90 deg, than when it is simply lifted vertically and moved by a motorized gantry. Our claim should, however, be modified to read "the first of its kind with swing-aside roof," and we are grateful that Demag's letter has enabled us to emphasize this point to your readers in the steel industry.

The Brymbo furnaces: To our certain knowledge the Brymbo installation was designed and constructed in wartime by Siemens Schuckert (Great Britain), Ltd., who, certainly at that time, had no connection with either Siemens & Halske or Demag, both of which are German firms. No German designs for this size of furnace were then available in this country. The use of the generic name "Siemens" to describe these furnaces can only be described as misleading.

On-load tap changing: In this instance we must admit responsibility for failing to notice in your proofs the omission of the all-important phrase "with off-load operation." Readers of the metallurgical Press may have noticed this discrepancy, as similar descriptions therein made this point quite clear and we did, ourselves, draw your attention to it in our letter of the 10th April which you published in the form of a correction on page 874 of your 17th April issue. We cannot agree more fully with Demag about the operational advantages of on-load tap-change switchgear and they will be interested to learn that this feature is to be incorporated in the 60 ton Birlec Lectromelt furnace under construction for a steelworks near Sheffield. This equipment will, when installed, be the largest unit with on-load tap-changing in the Commonwealth.

Birmingham. BIRLEC, LTD.

PRICES OF MATERIALS

IN the accompanying table we give the basis prices of the more important materials used in the electrical industry. The figures are those quoted on Tuesday last.

ALUMINIUM Ingots	ton £150 0s 0d
COPPER, H.C. Electro	ton £240 0s 0d
Fire Refined 99·70 per cent	ton £239 0s 0d
Fire Refined 99·50 per cent	ton £238 0s 0d
COPPER Tubes	lb 2s 3½d
Sheet	ton £296 10s 0d
H.C. wire and strip	ton £268 15s 0d
LEAD, English	ton £95 10s 0d
Foreign	ton £94 0s 0d
MERCURY	flask £61 15s 0d
TIN	ton £662 10s 0d
ZINC, G.O.B. Foreign	ton £75 0s 0d
Electrolytic	ton £76 5s 0d
BRASS Tubes	lb 1s 10½d
Sheet	ton £233 15s 0d
Wire	lb 2s 6¼d
PHOSPHOR BRONZE	
Wire	lb 3s 8½d
RUBBER, No. 1 R.S.S. spot	lb 17-17½d

VIEWS on the NEWS

By REFLECTOR

AT a time when the heat insulation of buildings has become a prominent topic we hear that London's Underground Railways are too effectively insulated. When the tunnels were first constructed they had an average annual temperature of about 50 deg F. Since then the heat generated by the braking of trains has gradually been absorbed by the tunnel linings until it has raised the average temperature to 73 deg. It was originally thought that the trains would push out the hot air before them but this expectation has not been realized. Consequently London Transport is having to put in a large fan installation between the Kennington and Oval stations on the Northern Line. At the same time steps are being taken to ensure that this installation does not create an overpowering blast, to the discomfort of passengers.

* * *

A speaker at a recent Church Assembly meeting protested at the use by churches of amplified recordings of bells instead of the real thing. He wondered how many people had admired some "sweet little tower" only to hear it suddenly "give forth sounds that would do justice to the carillon of Canterbury Cathedral." Even the electronically-minded cannot help but sympathize with the speaker's views. I suppose it was the B.B.C. which initiated the movement with its transmissions of Bow Bells, now, alas! to be heard only in recorded form.

* * *

Two recent accidents at Stockport in which electric vehicles were concerned led to suggestions at a meeting of the local Road Safety Committee that the fault lay in the vehicles' quiet running. Mr. V. W. Dale, writing to the *Stockport Advertiser*, as secretary of the Electric Vehicle Association, rightly asserts that this silence is one of the "electric's" chief attributes. He says that manufacturers are now fitting special mirrors to enable the driver when moving off to see whether there are any children playing at the front or sides of his vehicle. He offers to place before his members for consideration the question of introducing some noise-making device. I hope his members will not think this strange departure necessary and that they, with Mr. Dale, will suggest that the warning of children against playing around vehicles is a more desirable safeguard.

* * *

The writer of a letter to the *Manchester Guardian* has seen a photograph of an ensign flying above Battersea power station and asks by what right the British Electricity Authority flies an ensign of either the Royal Navy or of the Royal Naval Reserve or Merchant Navies. I suggest that it derives its right from its possession of a fleet of about fifty colliers (? Merchant Marine) which I hope to see reviewed all together at Spithead, or somewhere, one of these days.

* * *

Since writing this I have seen a note in the *Architect and Building News* which puts a different complexion on this flag-flying. Apparently it was the *white* ensign which appeared on the station—a builders' tradition when a structure is completed. Some European countries, says the note, use an evergreen wreath on such occasions. I remember having seen them in Switzerland.

* * *

Among the commendations of the Electrical Trades Union's training college, Esher, in the November *Electron*, appears the following:—

> "The course was very informative, the tutor, J. Vickers, M.A., conducting it in an atmosphere of friendliness which soon put everyone at each."

PERSONAL and SOCIAL

News of Men and Women of the Industry

THE appointment is announced of **Dr. W. Abbott**, C.M.G., O.B.E., formerly H.M. Staff Inspector of Engineering at the Ministry of Education, as director of studies in connection with the F.B.I. Overseas Scholarships Scheme. **Mr. W. V. Jenkins**, who has been responsible for the operation of the scheme since its inception, remains manager. The first two groups of scholars from Latin America have now arrived and begun their training at engineering works in this country. Four are from Peru and three from Cuba. Three more Indian scholars have also started, making 26 graduates who are receiving their training under the F.B.I. scheme.

Mr. T. R. Evans, commercial manager of the Rhondda, Ely Valley District of the South Wales Electricity Board, is retiring from that position, and has been presented with gifts from his colleagues.

Mr. W. G. Baillie, assistant area manager at Lerwick to the North of Scotland Hydro-Electric Board, has been appointed engineer-in-charge of the new peat turbine station at Altnabreac, Caithness. He is succeeded at Lerwick by **Mr. J. T. Tulloch**, who becomes generating engineer at the station.

Mr. E. F. Ward has been appointed assistant manager, Contracts Department of Johnson & Phillips, Ltd., as from 1st December. Mr. Ward, who before this appointment was a senior administrative engineer on the company's contracts staff, has been with J. & P. for over thirty years, and during this time has been actively concerned with many large electrification schemes, both at home and abroad. During the war he worked in conjunction with various Service Departments on matters concerning transmission and distribution. He is particularly well known in the oil, metallurgical and sugar industries with which he has long been associated on behalf of J. & P., and for his work on B.S.I. Committees. He received his technical training at Rutherford Technical College, Newcastle-on-Tyne, and served his apprenticeship with J. H. Holmes & Co., Ltd.

Mr. E. F. Ward

Mr. H. Pryce-Jones, M.Eng.(Liverpool), M.I.C.E., M.I.E.E., manager of the Mid-Sussex Sub-Area of the South Eastern Electricity Board, has been appointed a Justice of the Peace for Brighton. Mr. Pryce-Jones has been associated with the town since 1943 when he became chief electrical engineer and manager to the Corporation. In this position he was responsible for the design and early construction of Brighton "B" power station. He was formerly deputy city electrical engineer of Liverpool. Mr. Pryce-Jones has held his present appointment since the electricity supply industry was nationalized in 1948.

Mr. H. Pryce-Jones

Mr. M. J. Gartside, chairman and managing director of the Rheostatic Co., Ltd., left the United Kingdom for South Africa by South African Airways Comet on 11th November. He will be spending some time with the Rheostatic Co.'s subsidiary company, Contactor (Pty.), Ltd., at Zuider Paarl in the Cape, and will be visiting that company's various branch offices and customers in South Africa and Rhodesia before returning to England early in the New Year.

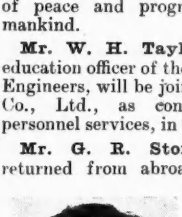
Mr. B. J. Bradford, A.M.I.E.E., has been appointed publicity manager of the Rheostatic Co., Ltd. Mr. Bradford has been with the company since 1947, and for the past four years has been manager of the Glasgow office. He is now at the head office at Slough.

Derby Electrical Society's first annual dinner at the Grandstand Hotel on 13th November, was attended by the Mayor (Councillor H. J. T. Russell) and representatives of several leading organizations in Derby's industrial life. Mr. F. H. Pooles, former manager of the Derby electricity undertaking and now sub-area manager to the

East Midlands Electricity Board, who helped to found the Society in 1945, said that the Society had been built on true democratic lines, with membership open to anybody in the electrical industry. The chairman, Mr. H. Perry, head of the electrical engineering department of Derby Technical College, thanked Mr. Pooles for allowing the Society the use of the electricity showrooms. Mr. M. R. H. Sadler, of Ashbourne, referred to the history of the Full Street power station site. Speaking of the possibilities of atomic development, the Mayor said that man's skill and ingenuity should be used in the interests of peace and progress for the benefit of mankind.

Mr. W. H. Taylor, B.Sc., A.M.I.E.E., education officer of the Institution of Electrical Engineers, will be joining the General Electric Co., Ltd., as controller, education and personnel services, in the New Year.

Mr. G. R. Stone, who has recently returned from abroad, has been appointed general manager of F. Westerman (Wholesale), Ltd., Birmingham. He was for twenty-two years Birmingham manager to the "Z" Electric Lamp & Supplies Co., Ltd., and relinquished that position on going to the United States where he was associated with the General Electric Supply Co., a division of General Electric Distributing Corporation, in Los Angeles, California.



Mr. G. R. Stone

Nearly 500 members and guests (including the United States Ambassador) attended the annual dinner of the **Radio Industry Council** at the Savoy Hotel, London, on 18th November. The president of the Council, Lord Burghley, K.C.M.G., LL.D., presided, and Mr. R. A. Butler, Chancellor of the Exchequer, was the guest of honour.

Mr. R. A. Butler, Chancellor of the Exchequer, speaking at the annual dinner of the Radio Industry Council. On his left is Lord Burghley

The toast of the Radio Industry Council was proposed by Mr. Butler and replied to by the president. Mr. G. A. Marriott (vice-chairman of the Council) proposed the health of the guests and Mr. Richard Dimbleby responded. During the evening Lord Burghley, after some introductory remarks by Mr. G. Darnley-Smith (chairman of the Council), presented Sir Noel Ashbridge, the former director of technical services, B.B.C., with his portrait in recognition of his contribution to the development of British broadcasting.

On 18th November at Goblin Works, Leatherhead, presentations were made to forty-six members of the staff of the **British Vacuum Cleaner & Engineering Co., Ltd.,** who have completed twenty-five years' or more service. A special presentation was made to the staff manager, Mr. W. J. Marchant, who has completed fifty years' service with the company. The presentations were made by Mr. J. J. Hambidge, chairman of the company.

On 14th November the chairman of the Uganda Electricity Board, **Mr. C. R. Westlake,** M.I.E.E., formally declared open the Board's European hostel situated at the top of Kololo Hill, overlooking Kampala.

Mr. C. R. Westlake opening the Uganda Electricity Board's hostel at Kampala

The hostel is known as "Ridgeway Court," and surrounding it are forty chalets in which members of the staff are accommodated.

In the advertisement for a personnel officer for the **London Electricity Board** in our last week's issue, by a printer's error, the provisional commencing salary was given as £1,800 to £2,200 a year. This should have read £1,900 to £2,200 a year.

An inaugural dinner to launch the **Institute of General Managers** was held at the Savoy Hotel, London, on 20th November. The speakers included Sir Patrick Hannon, immediate past-president of the National Union of Manufacturers and vice-president of the Federation of British Industries, Mr. H. E. B. Brightley, acting chairman of the Institute, Col. B. H. Leeson, immediate past-president of the Institution of Electrical Engineers, and Mr. W. Robson-Brown, M.P., a director of Richard Thomas & Baldwins, Ltd.

More than 650 members of the staff of the **British Insulated Callender's Cable** group from London, southern branch offices, Construction Co., district offices in the south, and Erith works, were recently entertained by the directors to a dinner, dance and cabaret at the Seymour Hall, London. A vote of thanks to the directors for their hospitality was proposed by Mr. H. F. G. Bicker (B.I.C.C. Exeter branch manager), and replied to by Mr. W. H. McFadzean (director and chief executive, B.I.C.C., and chairman of the B.I.C. Construction Co.).

Mr. K. F. Tebbutt, light group representative for Philips Electrical, Ltd., in the Warwickshire area since 1947, has completed twenty-five years' service with the company, and at a luncheon held at the Midland Hotel, Birmingham, on 26th October, Mr. W. F. Cassidy (regional manager, Midlands region) presented Mr. Tebbutt with a cheque and a gold watch on behalf of the board, and a leather wallet from colleagues in Birmingham.

OBITUARY

Mr. C. M. Thomas, transmission section engineer at Poole, Southern Division, B.E.A., died on 8th November at the age of sixty-three. Mr. Thomas was apprenticed in 1908 to the British Colliery Co., and became engineer-in-charge at the Coytralion Colliery in 1915 where he stayed until 1928. After two years as switchgear erector with Guest, Keen & Baldwins, he joined W. T. Henley's Telegraph Works Co., Ltd., as section engineer, and was subsequently an assistant section engineer with the Central Electricity Board from 1932 to 1948.

Mr. L. St. L. Pendred.—We report with regret the death on 20th November, at St. Margaret's, Twickenham, of Mr. Loughman St. Lawrence Pendred, C.B.E., who was editor-in-chief of the *Engineer* for forty-one years. He was eighty-two years of age. Mr. Pendred joined the staff of the *Engineer* in 1896 and succeeded his father as editor-in-chief in 1905, retiring from that position in 1946. In 1920 he was elected to the Council of the Institution of Mechanical Engineers, of which he had been a member since 1896, and he became president in 1930. He was a founder member and past-president of the Newcomen Society and a past-president of the Institution of Engineers in Charge.

Mr. L. Mellor.—The death occurred on 22nd November of Mr. Leonard Mellor, M.B.E., J.P., M.I.E.E., area manager, North East England and Northern Ireland, for A. Reyrolle & Co., Ltd. Mr. Mellor was born at Oldham in 1888 and attended the Rutherford and Armstrong Colleges, Newcastle-upon-Tyne. He was apprenticed to Reyrolles in 1904 and remained with the company until his death. For a number of years he superintended the erection of switchgear in this country and overseas until he was appointed area manager in 1921. In that position he was intimately concerned with the work of the former Newcastle Electric Supply Co. (later merged in the North Eastern Electricity Board's area). He also supervised the contracts and engineering work on switchgear for a number of important power stations including Carville, North Tees, Dunston, Barking and Littlebrook.

Mr. Mellor became an associate member of the I.E.E. in 1929 and a member in 1937. From 1937 to 1947 he was hon. secretary of the North Eastern Centre of the Institution and he was chairman in 1948-49. He had distinguished service with the Durham Constabulary and was responsible for the training and organization of the Felling Division of the special constabulary. For this and subsequent work during the war he was made an M.B.E., and he later became a J.P. for Durham County.

WILLS

Mr. W. A. Gillott, M.I.E.E., joint managing director of Gillott Electro Steam Cookers, Ltd., who died on 26th May, left £6,670 gross (£5,047 net).

Mr. F. G. Curel, A.M.I.E.E., for forty years manager and engineer of the Witney U.D.C. Electricity Department, who died on 5th July, left £22,650 gross (£22,529 net).

Mr. A. F. Bock, late manager of the Birmingham district office of the Metropolitan-Vickers Electrical Co., Ltd., who died on 21st June, left £12,361 gross (£10,592 net).

Mr. C. F. Phillips, M.I.E.E., consulting engineer, who died on 1st July, left £30,224 gross (£28,266 net).

PARLIAMENTARY NEWS

By Our Special Reporter

IN the House of Lords last week Lord Amulree called attention to the danger to the people of London caused by fog, and asked what had been done to make available an adequate supply of smokeless fuel for domestic use. In the course of his speech he referred to the power stations that had been erected in London. There were nine of these power stations on the banks of the Thames; in other words, they were in a valley, and that was where the worst smoke concentration and misty conditions for making fog would occur. He was not quite sure what treatment was now given to the fumes from power stations. He thought he was right in saying that before the war it was not compulsory but it was customary for the fumes coming up to be washed. Supposing that that washing was done efficiently and effectively, he was told that a 97 per cent efficiency could be obtained, which, he thought, was as good as could be obtained anywhere. He wanted to know if that was being done now. He believed that it had been stopped during the war because there was some kind of luminosity at night which could not be permitted, but he wondered whether a system of washing had now been adopted again.

The Earl of Listowel said that smoke was a nuisance, whereas sulphur was a killer, and the essence of the problem was to lessen the amount of sulphur that got into the air. Central and South-West London were particularly vulnerable, because there were three large power stations—Battersea, Fulham and Lots Road—situated within an area of 20 square miles. It had been calculated that 60 per cent of all the coal burned within this area was burned by the furnaces of these three power stations, and only one of them, he believed—Battersea—had plant for washing the gases. What the London County Council had proposed, as a remedy for sulphur pollution, was that the two main preventive methods which had already been tried out—the washing of gases and their dispersal from high chimneys—should be accurately tested, in order to ascertain which was the more effective. A serious difficulty about the washing of gas was its expense. He believed that at Battersea it was said to cost 8s to 10s for every ton of coal burned. It had been suggested that the Fuel Research Council should examine the possibility of finding a cheaper process for the washing of gas. If such a process could be discovered, it would have a revolutionary effect, because it could be used not only in power stations but in industry generally, without adding unreasonably to industrial costs, or, alternatively, putting an unfair burden on the consumer.

Lord Sempill agreed that most power stations in London had no equipment for the cleansing of these gases, and he urged that something should be done.

The Earl of Selkirk, Paymaster-General, replying for the Government, said that roughly half the smoke came from industrial plant and the other half from domestic grates. Of the 16,000,000 grates in this country, only about one-quarter could use the only smokeless fuel which was available in any quantity. That was the centre of the problem. Unless the cost of the smokeless fuels—"Coalite," "Phurnacite" and "Rexco"—could be brought within the reach of the average householder, they held no prospect of making more than a small, though valuable, contribution to smoke abatement. The plain answer was that so long as coal was burned in domestic grates, smoke would continue to be emitted. It was fair to say that they were making a good deal of progress. For instance, London was consuming no more coal as a whole, but was consuming to-day more smokeless fuel than it was ten years ago. The consumption of gas had gone up by 50 per cent, and the domestic consumption of electricity by nearly 100 per cent in those ten years. The cleansing of the flue gases at power stations was a difficult matter. The present method at Battersea was expensive and had certain disadvantages.

Post Office Progress

In the House of Commons, on the Committee stage of the Post Office and Telegraph (Money) Bill, Mr. Gammans, Assistant Postmaster-General, replying to questions by Mr. Ness Edwards, said the expenditure on television links was about £650,000, a large part of it for extensions to B.B.C. services already envisaged. Included was £52,000 for a cross-Channel link, because the B.B.C. hoped increasingly to pick up programmes from Europe. There had been as yet no decision on where the commercial television stations would be, but on the assumption that they might be in London, Birmingham and Manchester any new capital expenditure on Post Office links would be only a very small sum.

The Committee stage was concluded, and the Bill was read the third time.

Radio Telescope

Mr. Erroll asked the Parliamentary Secretary to the Ministry of Works, as representing the Lord President of the Council, whether he would

instruct the Department of Scientific and Industrial Research to withhold any further grant from its funds for the construction of the radio telescope which was being built south of Manchester until he was satisfied that the public money so expended would not be wasted by satellite town development reducing the value of the telescope.

Mr. Bevins replied in the negative. He had consulted the Minister of Housing and Local Government who saw no reason to believe that any town development, which might be proposed in the Congleton area, could not be so sited as to avoid electrical interference with the radio telescope at Jodrell Bank.

Television Questions

Captain Ryder asked the Assistant Postmaster-General what steps he had taken to ensure that the number of licences issued by his department for television sets corresponded reasonably well with the number of sets sold by the trade.

Mr. Gammans said that the trade supplied the Post Office every quarter with figures of its total manufacture and stock in hand, and these figures were of great help in assessing the degree of licence evasion.

Asked by Mr. Skeffington whether he was satisfied that interference from industry with television reception in Hayes and Harlington had now been overcome, Mr. Gammans said he was not. Unfortunately some high-frequency apparatus used for drying glue had been causing interference with television reception for a long time. In spite of the co-operation of the owners and the manufacturers of the apparatus, Post Office engineers had so far not been able to find a satisfactory solution.

Mr. Charles Ian Orr-Ewing asked the Assistant Postmaster-General whether he would now make a statement on the frequencies in Band III which might be used for alternative programmes so that the design of new television receivers could proceed.

Mr. Gammans said that the Postmaster-General hoped to make a statement on this matter very soon.

Telephone Orders

Sir Frederick Messer asked the Assistant Postmaster-General if he had yet had a conference with Standard Telephones & Cables in connection with the notice of redundancy recently issued to staff.

Mr. Gammans said that officials of his Department had had discussions with the company based on a suggestion made to him by some of the company's shop stewards that the reduction in the company's production programme was attributed solely to the Post Office having cancelled or transferred orders from the current production programme. That was not so. The company, in common with the rest of the telephone industry, had met with an unavoidable reduction in export work and, in order to keep up a reasonable level of production under these circumstances, the company planned a programme from the Post Office orders on its books to meet the situation. It should be understood that it was customary practice for the Post Office to agree with the industry as a whole, each year, the exact programme of production when the finances available to the Post Office for that year were known. In the case of the current year, it was found that the limitation of these finances so far as the company was concerned necessitated a transfer of certain items of the programme to the following year. Thus, from the Post Office point of view no cancellation or transfer had been made in the finally agreed programme, but the fact remained that the company did plan and could have produced the transferred work within the current year.

Licence Revenue

Mr. Wade asked the Chancellor of the Exchequer what percentage of the net revenue from radio and television licences was to be retained by the Treasury for the year 1953–54; what sum was expected to be received by the Treasury; and how much Exchequer grant-in-aid for overseas services was to be provided during the same period.

Mr. Boyd-Carpenter said that the answers to the three parts of the question were, respectively, 14 per cent; £2,050,000; and £4,950,000.

"Blab-off" Switches

Replying to Mr. Mayhew, the President of the Board of Trade (Mr. Thorneycroft) said he had not yet received any application for a licence to import "blab-off" switches (for cutting off the sound in television sets) from the United States. If one were submitted, the Board of Trade would consider whether the expenditure of dollars was justified.

Scottish Charges

Mr. M. K. MacMillan asked the Secretary of State for Scotland whether he was aware that the North of Scotland Hydro-Electric Board was applying a line-rental basis of charges for certain new consumers in the Western Isles.

Mr. Henderson Stewart replied in the affirmative. This was a matter within the discretion of the Board.

Sulphur Stocks

Mr. Slater asked the Minister of State, Board of Trade, as representing the Minister of Materials, how far he expected the stocks of sulphur this winter to fall short of what would be needed; and what steps he was taking to assist industry in this country to make good this shortage.

Mr. Heathcoat Amory said that sulphur stocks from now to the end of this year were not expected to fall below the level which industry had been in the habit of holding. Supplies of

sulphur for next year were now under negotiation.

Replying to further questions, Mr. Heathcoat Amory said that stocks of sulphur at 30th September, 1953, were 109,000 tons. At the corresponding dates in 1951 and 1952, stocks were 102,000 tons and 208,000 tons, respectively. The latter figure was unusually high owing to a drop in consumption.

"Facts About Fuels"

Mr. Nabarro asked the Minister of Fuel and Power whether he had completed his inquiries in the matter of the recent publication of a pamphlet by the British Electrical Development Association entitled, "Facts about Fuels," and whether he would make a statement.

Mr. Geoffrey Lloyd said he had. He thought that this pamphlet was open to criticism because it made certain misleading comparisons between fuels and he had told the British Electricity Authority so.

Mr. Nabarro asked if the Minister could say what steps he was taking to prevent the future publication of matters of this kind, of a promotional advertising character, by the B.E.A. and to restrain them from publishing these wholly misleading and inaccurate statements.

Mr. Lloyd: I cannot very well restrain them from promotional activities which are in the national interest. In this particular case I have been assured that it will not be repeated.

Wind Power

In reply to Mr. Grimond, Mr. Geoffrey Lloyd said that electricity was being produced by the 100 kW windmill in Orkney, and two machines working on the Andreau principle were being erected for test at St. Albans and at Cranfield.

Advisory Service Staff

Mr. Palmer asked the Minister of Fuel and Power what provision he proposed to make for members of the technical staff of his Department's Fuel Advisory Service who applied for appointments with the new Fuel Advisory Company but were not accepted.

Mr. Lloyd said it was hoped that most of the existing staff would be offered appointments with the new company. Those who applied but were not accepted would be considered, according to their qualifications, for reallocation to other Government Departments.

Nuclear Energy

Captain Orr asked the Minister of Supply what sites for nuclear energy power stations he had considered in Northern Ireland.

Mr. Sandys said he assumed the hon. member was inquiring about the site for the first breeder reactor plant for generating electricity. All parts of Great Britain and Northern Ireland, where the necessary facilities existed, had been considered.

Power Station Site

Mr. Pearson asked the Minister of Fuel and Power what application he had received to erect a power station at The Leys, Gileston, Glamorgan.

Mr. Lloyd said he had received no such application.

European T.V. Network

Mr. Peter Smithers asked the Secretary of State for Foreign Affairs whether he was aware of the terms of a motion passed at the last session of the Consultative Assembly of the Council of Europe with regard to the establishment of a European television network; and whether he would consult with the Postmaster-General with a view to ensuring effective British support for the industry in its efforts to bring such a network into being at an early date.

Mr. Dodds-Parker, Under Secretary, Foreign Office, said he was aware of the recommendations referred to. He was informed that a number of European broadcasting authorities including the B.B.C. were planning an interchange of television programmes over an international network to be set up temporarily in the middle of next year; further progress must await the outcome of this experiment.

Belfast Plant Contracts

IT will be recalled that some weeks ago a £3,000,000 contract for power station boiler plant placed by the Belfast Corporation with Babcock & Wilcox, Ltd., was later cancelled and, by direction, the contract was publicly advertised. Last Saturday, the Town Clerk informed the city electrical manager and engineer, Mr. R. P. Watson, that under the present regulations the Corporation had no option but to allow foreign firms to tender for the supply of plant. On 10th August the Electricity Committee decided not to consider tenders from C. Wykeham & Co., who asked if they could submit an offer of a turbo-alternator of West German manufacture, or, alternatively, of partly German and partly British manufacture.

Mr. Watson has now informed the Committee that the consultants have received a letter from the same firm dealing with a tender for a 150 ton electric crane of German manufacture, and also a letter from the France–Ireland Trading Co., asking for specifications of the plant for the new power station. With the approval of the Committee, Mr. Watson has sent a letter to the consultants drawing attention to the clause in the supplemental conditions of contract in respect of equipment not of British manufacture and relating to preference to Commonwealth countries.

A.C. Instrument Testing

Accuracy of Calibrating Equipment

THE discussion on the I.E.E. Measurements Section paper on a.c. instrument testing equipment by Dr. A. H. M. Arnold (*Electrical Review*, 20th November, page 1191) was opened by Dr. H. D. Hawkes (Elliott Bros.). He suggested that the accuracy of any standard should be five times greater than the accuracy required of the instrument to be calibrated and that stability should be several times better than accuracy of measurement. These conditions seldom occurred in practice. A specification was necessary for a precision instrument containing clauses giving permissible error on a non-sinusoidal wave shape and limiting the instability of supply on which the instrument could maintain its guaranteed accuracy. He still used reflecting dynamometer standards, arranged in a similar manner to the a.c./d.c. comparator, up to frequencies of 2·5 kc; a small error at the higher frequencies, due to the self-capacity of the moving coil, had been reduced by using wave-wound moving coils.

Checking Consumers' Meters

Mr. H. S. Petch (B.E.A.), referring to instruments needed by Area Boards to test consumers' meters, said that voltage and resistance standards could be transported more easily than the instrument for a.c./d.c. transfer and asked whether the instrument moving backwards and forwards between the N.P.L. and the Area Board test rooms could not be a rotating device. Such an instrument could be made transport proof and would be adequately repeatable and stable.

Mr. F. Byrne (B.E.A.) asked what was the permissible limit of error in accuracy of the test, if a standard instrument were more accurate than the test instrument. Was there a generally accepted relationship such as the author's factor of 10 to one? There should also be a relation between stabilization and accuracy, especially for energy meters. Both accuracy and stability were more readily obtainable with d.c. measurement than with a.c., so there must be a decided advantage if a.c. power and energy could be expressed in their d.c. equivalents. An a.c./d.c. comparator which would behave satisfactorily on an unstabilized a.c. supply had recently been described; it consisted of two dynamometer elements mechanically coupled but free to move in a limited arc. The d.c. source was stabilized so that a rotation in one direction showed an a.c. energy deficiency and in the other direction an a.c. excess. In reply to Mr. Petch, he stated that a rotating instrument had been produced with possibly the highest level of accuracy so far attained in this country.

Mr. G. N. Harding (R.A.E., Farnborough) mentioned that at the Ministry of Supply they had done work at frequencies containing up to the 15th harmonic, for which they had attempted to compensate the voltmeters, but they still had to verify the readings for these horrifying wave forms.

Mr. P. Vigoureux (Air Ministry) asked whether the difficulty with rotating machines was due only to their slip rings and brushes. Machines were available—although possibly expensive—which used fixed windings through an auxiliary gap.

Mr. A. J. Axworthy (Everett Edgcumbe) thought that the accuracy with a rectifier standard would not be very high, nor would it be maintained over a long period.

Mr. C. T. Baldwin asked what allowance should be made for the reversal error of d.c. with the vacuum-junction thermo-couple.

Methods of Manufacture

Mr. W. Bamford (Everett Edgcumbe) said that in earlier days the instruments were made by craftsmen, virtually by hand, whereas now they were made in large numbers by machines. Between 1908 and 1953, had there been a corresponding development in accuracy in the N.P.L. mechanical division dealing with dimensional standards? He said that although instruments might not be a great deal more accurate than in the early days, they were certainly more prolific.

Dr. Arnold, in his reply, said he would like his standard to be many times better than the test instrument, but his problem had always been to get any margin at all over his commercial competitors. If they tested an instrument with an imperfect wave shape, there was a slight element of doubt as to what the results meant. Equally, if a user later used the instrument on a non-sinusoidal wave shape, he did not know whether the records were of value. Usually no serious errors were due to a slight departure of the wave form from the sinusoidal shape. With a bad wave form or very high harmonics, the test should be at the highest significant harmonic.

The rectifier instrument could give trouble with a bad form. The only criticism he could make of the electronic power supply of Dr. Hawkes was that the output was smaller than even the Post Office amplifiers which he himself used.

They tested few rotating sub-standards at the N.P.L., but there was a great deal in favour of them for testing other rotating standards. Whether these should be more robust for transportation had to be proved.

Contact potential of electrostatic instruments were so unpleasant with the wattmeter that it had been abandoned for d.c., but he thought they had the voltmeters under control. The main disadvantage of the a.c./d.c. comparator was its slowness in operation. The fixed winding outside machine suggested by Dr. Vigoureux would reduce their troubles, but there would still be instability arising from the current to the driving motor. There was not much of a reversal error with thermo-couples.

Mr. Bamford had referred to the serious problem of moving over from the era of craftsmen to that of mass-produced instruments, but great credit was due to the manufacturers for the way this had been done.

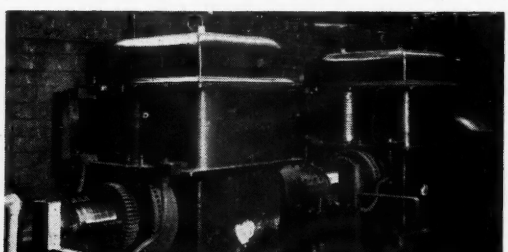
Long-Service Generators

AN old Holmes motor-generator set was withdrawn from service at Hebburn in October after an active life of probably more than sixty years. It is believed that the generators were made in or about 1890. They were of vertical pattern two-pole compounded design, with smooth-core armatures. Each machine was marked 110/136 V, 400 A, 460 r.p.m., and 700 A maximum. The current ratings were purely nominal; it was a common practice on the test beds where they were in use to overload them far beyond the nameplate maximum, without detriment.

These generators were in the power house at the Portland Road factory of J. H. Holmes & Co. for many years and were originally driven by a Belliss & Morcom steam engine, but the steam engine was later removed and an induction motor fitted in its place. When the Holmes Works was transferred to Hebburn the machines were transferred too and set up to supply the motor test bed.

The magnets were made of solid dynamo steel, cast in three pieces, the two vertical poles being mounted on brass stools for magnetic separation from the bedplate. The field coils were wound on steel frames with varnished teak end-plates. It took a long time to build up the flux each time the machines were run up to speed, despite the fact that the shunt fields were separately excited. The armature winding was held in position on the smooth core by binding wires spaced along the length of the armature, and the drive was carried between winding and core on a number of driving bars which fitted into longitudinal slots in the core. The armatures were 16in in diameter and 24in long. When the machines were dismantled almost 1½ tons of copper was recovered.

There were only two pedestal bearings, with oil-ring lubrication, in the complete set, one adjacent to each commutator. The rear end of the generator armature nearest to the drive was coupled to the drive and supported by it. A simple fan arranged in an annular space under the armature end winding was intended to help in cooling the end windings.



Sixty-year-old Holmes generators

OVERSEAS ELECTRICAL TRADE

Exports Remain Below 1952 Level

LAST month the value of British electrical exports was £1,333,043 lower than in October, 1952. So far this year exports of electrical equipment have amounted to £144·3 million against £154·7 million in the corresponding period of 1952, a reduction of £10·4 million (6·7 per cent).

Compared with September, last month's figures show an improvement of £1,402,360, but this is largely accounted for by the normal seasonal increase in activity after the summer holidays and the fact that October contains an additional day.

A glance at Table I reveals that the contraction from last year's high values was spread over most classes of goods

TABLE I.—ELECTRICAL EXPORTS

Class	September, 1952	September, 1953
	£	£
Telegraph and telephone cables and wires (submarine)	175,904	106,492
Ditto, not submarine	737,728	450,696
Cables and wires, paper insulated	1,041,864	569,506
Ditto, rubber insulated	494,731	338,914
Ditto, cotton, silk or artificial silk insulated	95,091	47,883
Ditto, enamel, glass or asbestos insulated	77,660	68,903
Ditto, other	344,519	190,319
Commercial radio apparatus	702,648	1,099,608
Domestic radio apparatus	347,221	309,810
Telegraph, telephone and signalling apparatus	1,667,532	1,317,884
Loudspeakers and microphones	33,083	42,796
Radio, telecommunication and electronic apparatus components and parts, n.e.s.	303,500	493,791
Other radio, telecommunication and electronic apparatus	272,989	335,720
Cathode ray tubes	31,540	19,903
Other valves	271,405	168,427
Carbons	14,679	27,284
Lamps, exceeding 24 V	68,067	72,429
Ditto, not exceeding 24 V	22,190	18,281
Other lighting appliances	437,287	443,858
Primary batteries	200,917	198,355
Parts other than carbons	10,946	29,216
Accumulators for motor vehicles	115,320	119,240
Ditto, traction	3,449	20,330
Ditto, radio	3,009	14,467
Other portable accumulators	94,539	41,879
All other accumulators	48,852	51,952
Parts and accessories	58,207	29,441
Cooking appliances	100,045	103,469
Heating appliances	79,654	69,619
Parts and accessories for cooking and heating appliances	78,740	77,712
Flat irons	61,665	84,273
Commercial electrical instruments	150,174	174,048
House service meters	117,364	81,003
Time recorders and time switches	8,738	18,133
Other electrical instruments	127,534	104,638
Electro-medical apparatus (not X-ray)	34,355	33,123
X-ray apparatus, other than tubes and valves	64,773	53,717
Vacuum tubes	76,228	74,319
Permanent magnets	30,862	35,015
Insulating cloth and tape	51,688	57,473
Other insulating materials	72,842	72,194
Unclassified electrical goods and apparatus	598,091	582,412
TOTAL, electrical goods and apparatus	9,327,630	8,248,532
Diesel driven generators, not exceeding 10 kW	298,119	79,237
Ditto, over 10 kW to 65 kW		128,700
Ditto, over 65 kW to 200 kW		108,467
Ditto, exceeding 200 kW	404,036	84,720
Other generating sets	110,741	233,053
Generators and parts of generators	496,520	615,907
Motors, railway, tramway and trolley-bus	7,627	—
Ditto, others not over ½ h.p.	143,701	163,083
Ditto, over ½ h.p. but under 1 h.p.	37,153	38,963
Ditto, from 1 h.p. to 250 h.p.	420,789	397,965
Ditto, exceeding 250 h.p.	130,737	47,815
Ditto, parts	90,311	115,263
Converting machinery	17,435	10,501
Transformers, including coils	943,318	975,274
Mercury arc rectifiers	118,817	59,989
Motor starting and controlling gear	232,791	259,678
Switchgear and switchboards (not telegraph and telephone)	1,251,894	1,215,192
Electrical machinery, n.e.s.†	382,631	98,783
TOTAL, electrical machinery	5,086,620	4,632,590
Washing machines (not exceeding 150 lb weight)*	322,480	310,834
Ditto (over 150 lb but not exceeding 250 lb weight)*		98,891
Ditto, parts	14,410	42,846
Vacuum cleaners	142,980	121,622
Ditto, parts	16,940	22,060
Other electrically operated portable appliances	162,174	200,627
Portable electric tools	108,773	137,342
Electrical pottery and glassware, including insulators	84,951	99,554
Electrical conduit tubes and cased tubes	52,345	71,362
GRAND TOTAL	15,319,303	13,986,260

* Not separately distinguished in 1952.

† The two figures are not comparable.

and machinery, though it was greatest in the former. Wires and cables, for long one of the most buoyant export categories, were in reduced demand. In the case of the paper insulated type, the fall was appreciable (from £1,041,864 to £569,506),

Table II.—Distribution of Electrical Goods and Apparatus

Destination	Oct., 1952	Oct., 1953
	£	£
Channel Islands	38,714	39,498
Gibraltar	44,719	4,069
Malta and Gozo	12,526	20,784
Cyprus	38,181	43,550
Gold Coast	69,329	54,504
Nigeria	135,145	117,995
Union of South Africa ..	855,029	603,564
Northern Rhodesia	75,887	67,242
Southern Rhodesia	158,004	102,690
British East Africa	393,799	269,676
Bahrein, Qatar and Trucial Oman	34,252	12,924
Kuwait	84,057	29,156
India	972,480	738,001
Pakistan	190,675	556,364
Malaya	435,379	327,221
Ceylon	129,374	132,056
Hong Kong	137,005	124,631
Australia	777,278	413,229
New Zealand	486,724	575,981
Canada	337,601	290,835
British West Indies	170,774	89,977
Anglo-Egyptian Sudan ..	51,143	43,968
Other Commonwealth Countries	127,072	245,261
Irish Republic	294,010	187,438
Soviet Union	20,937	95,361
Finland	41,642	18,176
Sweden	195,583	227,513
Norway	142,954	272,819
Iceland	16,234	12,820
Denmark	59,820	129,247
Poland	20,341	12,783
Western Germany	59,631	56,444
Netherlands	211,196	256,072
Belgium	196,734	310,206
France	120,208	132,407
Switzerland	48,121	37,759
Portugal	90,464	74,993
Spain	56,950	76,405
Italy	110,488	122,729
Austria	11,723	45,254
Czechoslovakia	14,588	2,184
Yugoslavia	20,071	12,339
Greece	57,906	46,196
Turkey	175,372	18,803
Portuguese East Africa ..	26,135	10,399
Syria	10,349	2,914
Lebanon	56,823	8,182
Israel	40,113	47,195
Egypt	143,512	67,593
Arabia	12,101	19,583
Iraq	129,992	89,282
Iran	14,782	10,276
Burma	65,915	37,152
Thailand	53,241	43,488
Indonesia	71,132	79,141
China	—	17,511
United States of America ..	77,911	166,718
Colombia	31,643	28,014
Venezuela	109,518	76,783
Peru	44,110	24,098
Chile	28,577	60,086
Brazil	220,565	24,798
Uruguay	20,743	19,369
Argentine Republic	53,753	75,816
Other Foreign Countries ..	396,325	288,710
Total ..	9,327,630	8,218,532

smaller purchases by India (£85,6[illegible]2 against £283,440) and Australia (£52,6[illegible]4 against £171,157) being mainly responsible. Among goods and apparatus the main relief from the downward trend was provided by commercial radio apparatus, exports of which rose to £1,099,699 from £702,648 in October, 1952; in the first ten months of the year £8,604,666 worth of apparatus of this kind has been sent to overseas markets—£2,219,786 more than in the corresponding period of last year.

Goods and apparatus exports (as distinct from machinery) are analysed according to destinations in Table II. The largest monthly rise was in purchases by Pakistan whose £556,364 worth compares with £124,306 in the preceding month and £190,675 a year ago. Belgium again bought substantially more than last year. Further progress was also made in the United States market, but Canada took less than last year and, in South America, Brazil bought only £24,798 worth of apparatus compared with £220,565 in October, 1952.

In contrast to exports, more electrical goods were imported than in October, 1952 (£771,000 against £684,656). Nearly half of last month's imports came from the Netherlands (£372,785 against £201,510 last year), the next largest supplier being the United States (£104,367 against £69,177). Electrical machinery imports were as follows: Generators, £10,502 (£72,955); motors, £39,740 (£46,295); and other sorts, £39,701 (£120,991): total, £240,241 (£89,943).

Development in Malaya

With the improved power situation in Malaya following the opening of the Connaught Bridge station efforts are now being made to stimulate greater use of electrical appliances. The Central Electricity Board offers hire-purchase facilities for domestic and small industrial domestic appliances; advances of up to $1,000 are offered for domestic apparatus, repayable over three years. Within the next few years construction is to begin on another new power station to replace the present Prai plant. The cost is expected to be about £25 million.

In Singapore the City Council is planning intensive campaigns for increasing the consumption of electricity and gas by selling and hiring more appliances to consumers.

COMMERCE and INDUSTRY

Television Proposals

Future of the British Industries Fair

ON Wednesday and Thursday this week the House of Lords debated the Government's policy on television as set out in the recent White Paper on the subject (Cmd. 9005, H.M. Stationery Office, 4d). This showed the Government to favour a service, competitive with the B.B.C., run by a new public corporation. This corporation would own and operate transmitting stations and hire its facilities to privately-financed companies which would provide programmes and draw revenue from advertisements. It would exercise some control over the nature of the material broadcast.

Initially the corporation would be given the use of two channels in Band III (174–216 Mc/s) and would begin with stations in London and possibly two other large centres of population.

Electrical Housecraft in Germany

Miss Joan Sharp, senior demonstrator of the Oldham Sub-Area of the North Western Electricity Board, who recently made a tour of Western Germany as holder of the 9th Caroline Haslett Trust Travelling Exhibition, will give the story of her visit in a paper to be presented at the Institution of Electrical Engineers on 26th January at 6 p.m.

Electrical Harpooning

A feature of this year's Antarctic expedition by Hector Whaling, Ltd., is that it includes the only catcher, *Setter V*, to be fully equipped for a complete season of electrical harpooning. This marks the development of the electrical harpoon equipment manufactured by the General Electric Co., Ltd., beyond the experimental stage, and is the culmination of six years' effort by Hector Whaling, Ltd., to supersede the conventional nose-bomb harpoon which has been used for the past seventy years. *Setter V* is on its way from Southampton to join the rest of the whaling fleet now assembling off Cape Town for the beginning of the whaling season. The G.E.C. electrical system on *Setter V* operates in conjunction with the new British spigot gun designed by Westley Richards, Birmingham, exclusively for electrical shooting, and uses the electrified nylon forerunner just patented by Pirelli-General Cable Works, Ltd.

"Life in 2000 A.D."

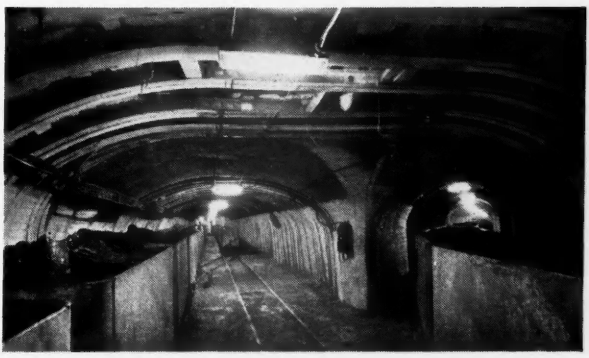
As a part of its bicentenary celebrations next March the Royal Society of Arts is conducting a competition in which entrants are asked to give, in written or visual form, forecasts of "The Practical Aspects of Life on this Earth in the Year 2000." Prizes totalling £500 in value are offered, the first prize being £250, and particulars and entry forms can be obtained from the Secretary, John Adam Street, Adelphi, London, W.C.2.

Colliery Lighting

The Simplex Electric Co., Ltd., has supplied a large number of its new non-flameproof fluorescent lighting fittings to the National Coal Board's (West Midlands Division) Mid-Cannock Colliery at Cannock, Staffs, where a scheme is in progress to link this colliery up underground with the Cannock and Leacroft Colliery.

The company has supplied 150 non-flameproof 2ft 40 W fluorescent lighting fittings for the loco-roadways. These have been installed at

Simplex fluorescent lighting fittings installed at Mid-Cannock Colliery



24ft intervals at an average mounting height of 10ft 6in. Thirty fittings are wired to a circuit which is fed from a Simplex distribution panel. The illumination reading beneath the fittings is 3 ft-candles and mid-way between any two fittings, 1 ft-candle. The installation was carried out by the colliery's electrical department.

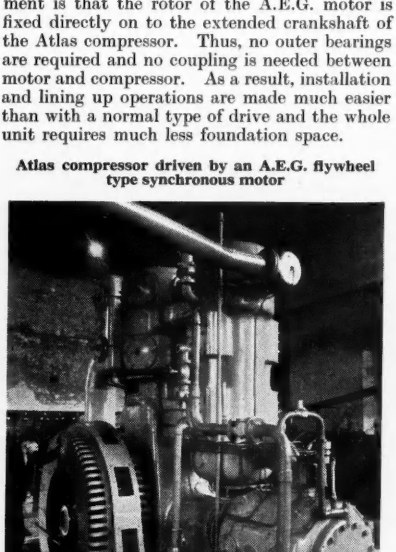
Technical Teachers' Salaries

Last week the Burnham Technical Committee published particulars of new agreed salary scales for teachers in technical and art colleges and schools. The proposals are being submitted to the bodies concerned and if and when approved will be placed before the Minister of Education. The new scale would operate for three years from 1st April next. Additions ranging from £20 to £35 a year are proposed. Principals' salaries would be reviewed and adjusted as from 1st April next in the light of the new salary scales for lower positions.

Unusual Drive for Compressor

The first compressor with a flywheel type synchronous motor to be installed in Britain is now running at the Mountain Colliery, South Wales. The unusual feature of the arrangement is that the rotor of the A.E.G. motor is fixed directly on to the extended crankshaft of the Atlas compressor. Thus, no outer bearings are required and no coupling is needed between motor and compressor. As a result, installation and lining up operations are made much easier than with a normal type of drive and the whole unit requires much less foundation space.

Atlas compressor driven by an A.E.G. flywheel type synchronous motor



The stator of the motor is made easily removable which means all parts of the motor are easily accessible for inspection. The motor has an output of 540 h.p. and a leading power factor of 0·9 at full load.

Ten Atlas AR9 compressors have been ordered by the National Coal Board. Two are already in use at the Mountain Colliery, near Swansea, another one has been installed in a Welsh colliery ready for operation, four are waiting to be installed and the other three have yet to be delivered. The initial compressor, which was installed at the Mountain Colliery, was direct coupled to an auto-synchronous motor. The remaining nine will all be equipped with flywheel type synchronous motors.

Contract Price Formulæ

The British Electrical and Allied Manufacturers' Association has issued the figures for its contract price adjustment formulæ. In each case the rate of pay for adult male labour at 14th November is deemed to be 141s 6d. The "cost of material" figures are as follows:—

For electrical machinery and equipment the Board of Trade index figure published on 14th November is 153·2.

For turbo-generating and allied plant: materials used in mechanical engineering industries, 144·9, blast furnaces and iron and steel smelting and rolling (40 and 41), 144·2; price of $\frac{3}{4}$in o/d 18 s.w.g. brass condenser tubes (*Metal Bulletin*, 13th November), 3s 7$\frac{3}{4}$d per lb.

Outstanding contracts covered by the Board of Trade intermediate products index: the index figure for intermediate products (14th November) is 352·9.

Tungsten Ore Prices Reduced

The Ministry of Materials has announced the following reductions in its selling prices for tungsten ores of standard 65 per cent grade and ordinary quality as from 24th November:—

Wolframite from 225s to 210s; Scheelite from 210s to 195s per long ton unit delivered consumers' works.

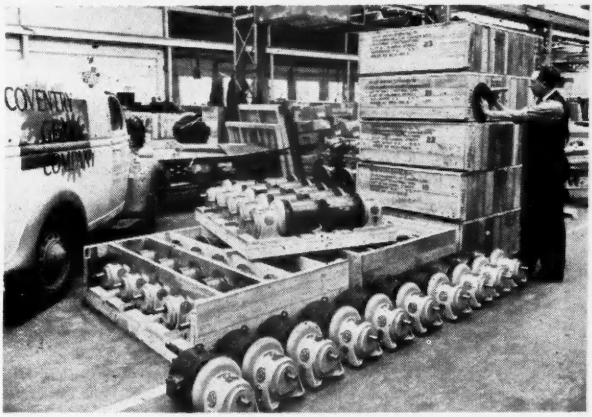
Eastern Board Publicity

Among the latest publicity matter produced by the Eastern Electricity Board is an eight-page folder giving illustrations, brief details and prices of a variety of electrical appliances suitable as Christmas gifts; they range from cookers and washing machines to lighting fittings and car radiator heaters. The Board is also circulating a pamphlet illustrating and describing thermal storage heaters for commercial and industrial use.

Motors for Canada

The accompanying picture shows part of an order for 350 "Coventry" geared motors being prepared for despatch from the Coventry Gear Co., to Canada. This £15,000 contract was

"Coventry" geared motors which form part of a large Canadian order



negotiated by the company's Canadian associates, David Brown (Canada), Ltd., who secured the order, in the face of keen competition, from the Aluminum Co. of Canada, Ltd. The gear units, a standard product of the Coventry Gear Co., give a choice of 17 output speeds ranging from 25 r.p.m. to 345 r.p.m., with input power from 0·25 h.p. to 2 h.p. They will be used to raise and lower the electrodes employed in the reducing furnaces at the aluminium smelting plant being built at Kitimat.

Future of the B.I.F.

It was announced this week that the Government had decided to transfer the responsibility for the London Section of the British Industries Fair from the Board of Trade to a new private Corporation. The Birmingham Section will remain in the hands of the Birmingham Chamber of Commerce.

It is proposed that the new Corporation, a company limited by guarantee, will have a chairman and six members, four of whom will be appointed by trustees representing the Federation of British Industries, the National Union of Manufacturers, the Association of British Chambers of Commerce, and the Trades Union Congress. The Board of Trade and the Birmingham Chamber of Commerce will nominate the other two members.

The Government will guarantee loans raised by the Corporation up to £100,000 for the first five years beginning with 1955. Arrangements for next year's Fair, which are well advanced, will be continued by the Board of Trade. It is intended that the Government shall continue to assist the Fair in the matter of overseas publicity.

Lifts for London Airport

The Express Lift Co., Ltd., has received orders from the Director of Contracts, Ministry of Transport and Civil Aviation, to supply and install in the London Airport headquarters building four passenger/goods lifts each with a capacity of 4,800 lb, two passenger lifts with a capacity of 3,000 lb, and two goods lifts each having a capacity of 3,450 lb. The company has also received an order from Taylor Woodrow Construction, Ltd., for lifts for the control tower at London Airport headquarters building. The order comprises one passenger lift with a capacity of 2,700 lb and one goods lift with a capacity of 3,360 lb.

Motor Control Gear Showroom

For some time past the Belmos Co., Ltd., of Bellshill, Lanarkshire, has felt the need for a London showroom to display its motor control gear, etc. A representative selection of equipment has been maintained in London, but a convenient means of displaying it has not been possible hitherto. A showroom has now been opened at Columbia House, Aldwych, W.C.2, where examples comprising both industrial and flameproof types of motor control gear, arranged as individual starters and as group motor control switchboards, are displayed. The lighting of the showrooms is provided by the company's flameproof fittings.

Cork Electrical Engineering Faculty

Among other developments in the coming year at Cork University College, will be the opening of the new Electrical Engineering Department. Hitherto, students of Southern Ireland who wished to take a degree in electrical engineering had to go to the University College, Dublin. Professor F. J. Teago, formerly Professor of Electrical Engineering, Liverpool, has been working upon the installation of equipment. The formal opening of the new Department is provisionally fixed for 24th October, 1954.

Exhibitions at Hoover Factories

Hoover, Ltd., last week arranged exhibitions of their products and film shows at their factories at Perivale, Middlesex; Merthyr Tydfil, Wales, and Cambuslang, Scotland. These exhibitions,

which followed the lines of those in the recent national Hoover week, showed especially for the employees and their relatives all Hoover products, made at the local and other Hoover factories.

Unions' Strike Decision

At a meeting of the executive committees of the trade unions affiliated to the Confederation of Shipbuilding and Engineering Unions on 19th November it was decided to recommend a one-day strike on Wednesday next, 2nd December, as a protest against the employers' rejection of their claim for a 15 per cent increase in wages. It was hinted that this was a preliminary to probable further action, meaning a ban on overtime.

Mr. H. Brotherton, president of the Confederation, said that the Minister of Labour would be informed of the decision as a matter of courtesy.

An amendment seeking to have the dispute referred to a court of inquiry was rejected, as was also a proposal that overtime working should cease from 3rd December.

It is stated that the threatened strike would involve between two and three million workers. There is some doubt whether the general workers' unions in the Confederation will fall in with the strike proposal.

Convection Heating Costs

The cost of running an " Ekco Thermovent " convection heater in comparison with an ordinary electric fire, both operating under similar conditions within the building, is shown in the accompanying picture of a window display at the premises of Mortimer Gall & Co., Ltd., 115–117, Cannon Street, London, E.C.4.

Window display indicating the comparative running costs of an ordinary electric fire and a convector

Meters indicate the cost of the electricity consumed by both heaters when running for 24 hours, and a card records the previous day's readings.

Power Factor Conference

On Wednesday, Thursday and Friday of this week the South Wales Electricity Board has been holding a Power Factor Conference and exhibition of equipment at Cardiff for its own staff and industrialists in the Board's Eastern and Central Sub-Areas. The purpose has been to impress upon industrialists the financial and technical benefits of power factor improvement and with this in mind invitations have been sent only to those whose installations have a power factor below about 0·85.

Each afternoon the conference has been opened by Mr. W. A. Gallon, the deputy chairman of the Board, and he has been followed by Mr. W. P. Warren, who has initiated a discussion on p.f. improvement. After tea the delegates have inspected the displays arranged by manufacturers of equipment.

Management Conference

The three main speakers at the British Institute of Management's eighth annual conference held at Harrogate from 11th to 14th November were Lord Reith, chairman of the Colonial Development Corporation; Mr. P. Thorneycroft, M.P., President of the Board of Trade; and Sir Ewart Smith, technical director of I.C.I. They all stressed the new and grave responsibilities with which management was faced to-day.

Lord Reith, who opened the conference of 800 delegates, appealed to industry not to eliminate the distinction between trustee director and executive manager unless it realized what was involved. He also discussed the effects of the dominance of the stockholder on the proficiency of management and the advantage of the public corporation system.

Mr. Thorneycroft, in referring to foreign competition, said that fierce competition was coming not only from Germany and Japan, but from the United States, whose exports to-day were three times what they were before the war. The only answer was to go out and beat them at the game. Referring to the economic policy of the Government and the question of tariffs, he said that while he admitted that there were governmental responsibilities, there was nothing any Government could do if British industry could not compete in price and quality and in delivery date.

Sir Ewart Smith said that the supreme responsibility of management at the moment was to

make clear to itself and then to its people what were its objectives and philosophy. Not only were the technical aspects (including organization) management's responsibility but also the human attitude to work. It was announced that next year's conference will be a European one with delegates attending from all the member countries of the International Committee for Scientific Management.

Tools and Supplies Catalogue

The 1953 catalogue of Buck & Hickman, Ltd., 2, 4 & 6, Whitechapel Road, London, E.1, is probably the most comprehensive general catalogue of small tools and supplies published. The last one issued was in 1935, and the new publication (1,267 pages) is larger by some 100 pages. It is profusely illustrated and each item is priced, although the company points out that owing to the length of time required for printing, many prices may have changed. In addition there are a number of pages of formulæ and tables. Reference to the various items is facilitated by an alphabetical index.

B.E.P.C. Change of Address

From 1st January next the address of the British Electrical Power Convention will be Winsley Street, London, W.1.

Exhibition of Signs

A comprehensive display of plain, reflex and illuminated signs is being given by Gowshall, Ltd., at its premises in Lambs Conduit Passage, Red Lion Square, London, W.C.1, until 4th December. Special attention is drawn to flashing beacons, rigid p.v.c. sheet and reflective signs which embody the use of minute glass beads 0·004in in diameter.

Practical Electricians' Pocket Book

The 1954 edition of this pocket book, which has been published at 5s (including postage) by Odhams Press, Ltd., 6, Catherine Street, London, W.C.2, has a new section on electricity and productivity. Other chapters deal with the layout of factory installations, the maintenance of cookers, bell, alarm and call circuits, and fans and blowers. There is also a survey of industrial electronic instruments and machines and guidance on choice, installation and maintenance. Several other sections have been thoroughly revised.

Ferguson Pailin Fire

A fire, which occurred on the night of 18th November, destroyed the Woodworking Departments of Ferguson Pailin, Ltd. Fortunately, the building concerned was external to the main works and little dislocation of production is anticipated.

Trade Announcements

Mr. R. W. Allen, B.Sc.(Eng.), A.M.I.E.E., has been appointed North-East area representative for **Nife Batteries,** Redditch, in succession to Mr. S. K. Hodgkinson. Mr. Allen will cover Northumberland, Durham, Cumberland, Westmorland, and parts of Yorkshire.

Mr. L. Pratt has been appointed by **E. K. Cole, Ltd.,** as car radio sales representative for the South-Western territory of England.

Mr. R. Fenwick has joined the **Telegraph Construction & Maintenance Co., Ltd.,** as technical sales representative for the North-Eastern area.

Airmec, Ltd., has formed a new " small quantity " division. This new division has been formed, in response to many requests, to manufacture small numbers of electrical and electronic apparatus and equipments to customers' drawings, sketches, or models.

Smiths Industrial Instruments, Ltd., announces the appointment of Mr. M. D. Davidson as its Scottish technical sales representative operating from 153-155, Bothwell Street, Glasgow, C.2 (telephone : Glasgow Central 3972).

W. Edwards & Co. (London), Ltd., have now removed to their new premises, Manor Royal, Crawley, Sussex (telephone : Crawley 1500; telegrams : " Edcohivac, Crawley "). The Scottish branch is still at 44, West George Street, Glasgow.

Catalogues and Lists

General Electric Co., Ltd., Magnet House, Kingsway, London, W.C.2.—40-page booklet containing a list of products of the G.E.C. and associated manufacturing companies and names of overseas agents and branches.

Dynamo & Motor Repairs, Ltd., Wembley Park Works, North End Road, Wembley, Middlesex. — Booklet illustrating the company's activities entitled " Keeping Electrical Plant in Action."

Cryselco, Ltd., Kempston Works, Bedford. —Illustrated priced broadsheet of "Cryselco" industrial lighting fittings.

Ward & Goldstone, Ltd., Pendleton, Manchester, 6.—1953/54 edition of the company's electrical accessories catalogue including index.

M.K. Electric, Ltd., Wakefield Street, Edmonton, London, N.18.—Illustrated priced catalogue of " M.K." electrical accessories.

Dorman & Smith, Ltd., Ordsal Electrical Works, Manchester, 5.—22-page priced catalogue giving details of the company's latest miniature circuit breakers.

Building Exhibition

Opportunities for Increased Use of Electrical Appliances

THE building industry has always appeared to us somewhat backward in the extent to which it has employed electrical equipment, not so much in the installations themselves, but in the actual constructional work. This state of affairs is, however, being rapidly rectified if the large number of electrical appliances now on view at the Building Trades Exhibition at Olympia, London, is anything to go by. The exhibition closes on 2nd December.

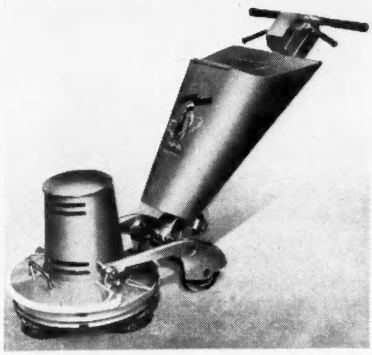
Apart from displays, too numerous to refer to individually, of fixed machines covering almost every conceivable requirement for wood, metal, etc., working, there are many interesting developments in portable tools. A ¼in general purpose drill claimed to have 50 per cent more power than similar units, a lightweight orbital sander costing £11 10s, a portable jig saw and a channeller for brick are all shown for the first time by S. N. Bridges & Co., Ltd., while new Flextol products also include an orbital sander, as well as a high speed cutting-off wheel.

A 3in portable belt sander is one of the latest items made by Wolf Electric Tools, Ltd., who also show two types of saws, a combined mortiser and drill, hammers, screwdrivers, grinders and soldering irons. A high speed portable router is demonstrated by the Central Tool & Equipment Co., Ltd., cutting not only wood but aluminium and plastics. The "Tarplaner" portable plane has 4in knives and can be used on any width of wood, also trimming laminated plastic boards: it is shown with "Swifsure" portable saws on the British Equipment Co.'s stand. Apart from electric tools, the Consolidated Pneumatic Tool Co., Ltd., includes in its display one of its smaller portable air compressors. The new Kango "H" type hammer, designed primarily for heavy duty concrete breaking, is almost certainly the most powerful portable electric hammer manufactured.

Comprehensive displays of fixing tools and devices have been arranged by both Philplug Products, Ltd., and the Rawlplug Co., Ltd. The Barrmor Tool Works, Ltd., shows its "Rollofix" wall fixings and foundation bolts. Cartridge operated tools for fixing bolts into hard materials are well represented by Adam & Harvey (Rapid Hammer), Ltd., the Langham Export Co., Ltd., Roura & Forgas, Ltd., Condrup, Ltd., and F. H. Bourner & Co. (Engineers), Ltd. The rapidity, efficiency and the saving of labour provided by the use of trays for fixing cables to concrete and steel structures are stressed by G. A. Harvey & Co. (London), Ltd.

Floor preparation, treatment and maintenance have come in for a good deal of attention. Besides improving its existing floor sanders and planers, Nufloor, Ltd., has brought out a new lightweight 8in sander with a 1 h.p. a.c./d.c. motor, a cutting speed of 3,000 ft/min, pressure adjustment from the handle shaft, and a fan mounted direct on to the motor spindle, thus eliminating fan bearings and belt: its price is £95. A selection of W. Crockett & Sons' products includes a complete range

A portion of the E.D.A. exhibit is seen in the photograph at the top of the page



Cimex-Fraser Tuson " Vulture " floor scrubber

of terrazzo surfacing machines. Various types of polishing and scrubbing machines are shown by A. Elder Reed & Co.

In a redesigned range of industrial floor scrubbing, drying and polishing machines shown by Cimex-Fraser Tuson, Ltd., the three-brush dual rotation movement has been retained but the mechanism is now totally enclosed and absolutely silent. The water feed is through the centre of each brush and reaches the floor only through the bristles, eliminating splash and also making the machine suitable for the scrubbing of carpets *in situ*.

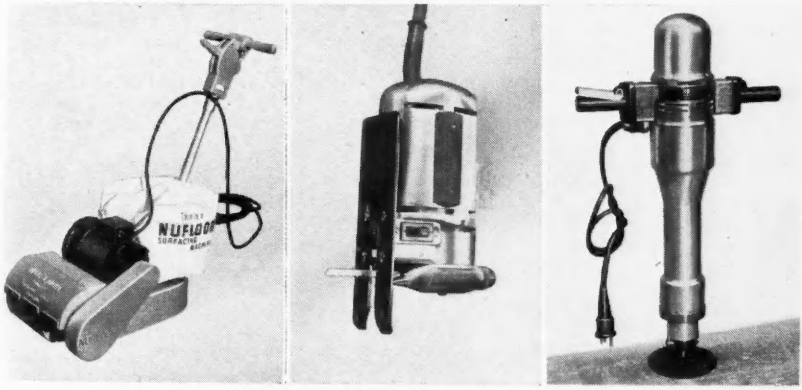
Apart from a complete range of floor scrubbing, polishing, dry cleaning, power scraping, drying, polish spraying, etc., machines the Columbus-Dixon Organization demonstrates its power float system of dry mix concrete and granolithic floor laying, which is claimed greatly to increase the speed of laying and to give stronger floors combined with lower material costs. Electric vibrators for compacting concrete are shown by E. P. Allam & Co., the Liner Concrete Machinery Co., Ltd., and the Warry Patent Building Equipment Co., Ltd., the last-mentioned company also including in its display a modified version of its " Trojan " mobile platform hoist.

A new Lister power loader for lifting cases, sacks, etc., is exceptionally light and manœuvrable. Lister generating sets include " Start-o-Matic " units. A trailer mounted 5 kW diesel generating set with floodlight projectors on the top and output sockets for portable tools is accompanied on the Arthur Lyon stand by a 30 kW diesel alternator set, a 1·2 kW portable lighting unit, " Stamford " motors and pumps. A 50 kW diesel alternator is a prominent exhibit of the Brush Group. A comprehensive range of pumps by James Beresford & Son, Ltd., includes submersible units with outputs from 3,000 to 110,000 gal/hr.

A novel use of infra-red heating for workmen in static positions or using hand-numbing machinery in cold weather is demonstrated by Philips Electrical, Ltd., who also show the use of their floodlights in building work.

Turning now to electricity service installations in houses and flats, the British Electrical Development Association has a relief

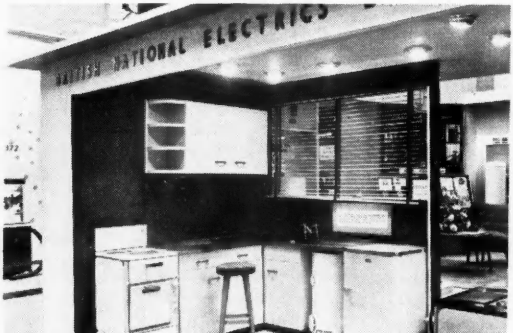
Left: **Nufloor lightweight 8in sander for floor treatment.** *Centre:* **S. N. Bridges & Co. jig saw.** *Right:* **Kango " H " hammer for concrete breaking, etc.**



model of the ground floor of a house showing the use of the ring main circuit. Apart from demonstrating the appliances available, a series of displays indicates the appropriate type of outlet to use, with comparisons of old and new methods of installation. Methods of electric water heating are also dealt with, the need for adequate lagging of hot water storage tanks being particularly emphasized. Floor heating with embedded cables and block type radiators are other items of interest. An underfloor duct wiring system is demonstrated by the Key Engineering Co., Ltd.

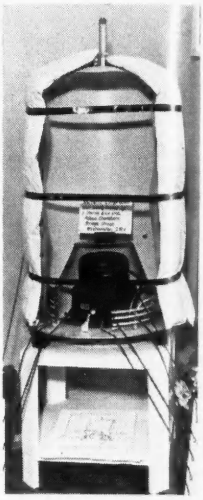
Model kitchens are to be seen on the stands of Easiclene Porcelain-Enamel (1938), Ltd., which includes examples of its refrigerators and washing machines, Peerless Built-in Furniture, Ltd., Redwing, Ltd., and British National Electrics, Ltd. The B.N.E. display also includes a wide range of cookers, water heaters, fires and other space heating equipment. A representation of a house in cross-section and illuminated bubble-flow diagrams illustrating the simplicity of installing twin and cistern type water heaters is one of the devices used to demonstrate the construction or application of the various appliances.

The new "Sadia Select" 3 gal storage water heater making its first appearance on the Aidas stand is a flat unit of modern design and appearance, available in four colours. With it are other storage heaters of from $1\frac{1}{2}$ to 15 gal capacity, coal-electric units and immersion heaters. Elsy & Gibbons, Ltd., show "Elson" tanks incorporating immersion heaters. Various crockery and glass washing machines are demonstrated by Staines Kitchen Equipment Co.



Model kitchen by British National Electrics, Ltd.

Demonstration of the domestic application of the heat pump



Among a greatly extended range of "Ekco Thermovent" heating equipment on the E. K. Cole stand particular attention is directed to the floorstanding models, the "FR" and "SR" series, and the new "Radiant Glass" heater. Special features of the "FR" and "SR" portable units are their improved appearance, increased air circulation, more effective automatic heat control and even greater safety. Oil filled radiators are shown by Dimplex, Ltd., Gulf Radiators, Ltd. ("Hurseal"), and Steel Radiators, Ltd.

Several types of "Tempaflex" forced convection heaters are shown by Flexaire, Ltd., while Greenwood's & Airvac Ventilating Co., Ltd., include in their display the "Extrare" lightweight fan unit for windows and partitions. The "Copperad" fan coolers, operating from a central supply of chilled water or brine, are available with 5,000–35,000 B.Th.U./hr extractors. An exhibit by the Ministry of Fuel and Power shows by means of two working models the method of operation of the heat pump as applied to domestic premises for heating, cooling, ventilating and hot water supplies.

A number of new lighting fittings shown by the Edison Swan Electric Co., Ltd., include the "Unilux" 5ft fluorescent batten unit, a twin 5ft lamp fitting, a cold cathode reflector, a colour blending industrial unit and various street lighting fittings. Among "Ediswan" wiring accessories are the "Avon" a.c. switches

with only two moving parts and the "Windsor" range of 13 A flat pin accessories incorporating a quick re-fusing device.

In addition to synchronous clocks and time switches, English Clock Systems, Ltd., show a number of clocks, time recorders, etc., controlled by a pendulum master clock independent of a mains supply. Electrically operated and photo-cell controlled doors are exhibited by the Bolton Gate Co., Ltd.

FUEL EFFICIENCY

Conserving the Nation's Resources by Electrical Methods

THE electrical industry's important contribution to achieving the most efficient utilization of the country's fuel resources and to eliminating atmospheric pollution is forcibly demonstrated at the Fuel Efficiency Exhibition which until to-morrow (Saturday) evening is being held at the City Hall, Manchester. Apart from the exhibits of individual manufacturers and the British Electrical Development Association, two large displays each have been arranged by the British Electricity Authority and the North Western Electricity Board.

A review of past achievements and an indication of future progress are given on one of the B.E.A. stands. The harnessing of water and wind power is represented by a model of the Invergarry water turbine generating station and a special wind power generator display. The 275 kV supergrid and the cross-Channel links are exemplified as developments in power transmission, while investigations into new sources of power include the gas turbine and atomic energy.

A model of Britain's first experimental nuclear power station now being built at Calder Hall, Cumberland, on view to the public for the first time, by co-operation with the Ministry of Supply, shows the turbine house with its attached administrative control and workshop block. On each side are the two reactors, in which heat is generated in graphite-moderated uranium piles. The heat is transferred by gas to the four vertical boilers seen round each reactor, fans circulating the gas being situated in the buildings on each side of the reactor. The steam passes to the turbine house where it drives four conventional turbo-alternator sets. Adjoining this B.E.A. exhibit is a section devoted to fuel efficiency as achieved in the iron and steel, chemical, sugar, soap, textile, brewing, etc., industries.

On the other B.E.A. stand are illustrated some of the ways in which it strives to obtain the maximum electricity output for a given quantity of fuel. A graph showing the rise in thermal efficiency of the power stations is accompanied by striking displays emphasizing the way in which power stations make good use of low grade coal unsuitable for other purposes and also by the use of electrostatic precipitators reduce the amount of smoke and soot emitted. Further sections of the display deal with the training of stokers and the work of station chemists.

Stress on electricity's contribution to cleaner living is also made on one of the North Western Electricity Board's stands where, with maps showing the graduations of air pollution in the country, it is pointed out that though power stations use 16 per cent of the nation's coal they produce only 0·4 per cent of its smoke. To indicate electricity's efficiency it is shown that an electric cooker provides a meal for four people with one unit, which in turn is generated by only $1\frac{1}{3}$ lb of slack at the power station. With the cooker are other electrical appliances which use energy to the fullest advantage without waste. On the other N.W.E.B. stand are demonstrated photo-electric sorting, process timing, metal detection, flame detection, and space heating by the use of thermal storage units incorporating concrete blocks.

With the theme "Electricity, a Power of Good for Greater Productivity," the E.D.A. focuses attention on electrical aids to industrial efficiency, demonstrating

infra-red heating for bottle capping on a conveyor, induction heating for brazing small components, and fully automatic plastic moulding. The new technique of machining by electric spark discharge is also demonstrated, while the greater efficiency attained by well-planned fluorescent lighting is stressed by a display including some of the latest fittings.

The National Coal Board's long-term plan for power generation includes replacing steam by electricity and using more and more inferior coal for generating electric power. This will take some time to achieve but the improvement of present methods is already starting to show results. In the meantime more mechanical stokers are being fitted as well as control equipment and instruments.

Among the manufacturers exhibiting are the following:—

Ashworth & Parker, Ltd. (back-pressure engine coupled to a 68 kW Lancashire Dynamo generator); Babcock & Wilcox, Ltd. (boilers, stokers, etc.); Keith Blackman, Ltd. (ventilating plant, blowers, unit heaters, etc.); Davidson & Co., Ltd. (fans, dust collectors, etc.); Dimplex, Ltd. (oil filled radiators); Electric Resistance Furnace Co., Ltd.; Elliott Bros., Ltd. (instruments); George Ellison, Ltd. (switch and control gear).

Ferranti, Ltd. (fires, water heaters and maximum demand alarms); Fielden (Electronics), Ltd. (instruments); General Electric Co., Ltd. (model of Uskmouth power station, thermal storage space heater, unit heaters and domestic appliances); Hopkinsons, Ltd. (Hopkinson-Ferranti valve, soot blowers and other boiler equipment); James Howden & Co., Ltd. (forced and induced draught fans, air preheaters and dust collectors); International Combustion, Ltd. (model of Drakelow power station and boiler plant); Kelvin & Hughes (Industrial), Ltd. (instruments).

Lancashire Dynamo Group (transformers, voltage regulators, testing equipment, motors, switchgear and vehicle battery chargers); Radiovisor Parent, Ltd. (photo-electric apparatus for smoke detection, flame failure, counting, light control, etc.); Rhymney Engg. Co., Ltd. (electro-pneumatic control equipment); John Thompson, Ltd. (boiler plant); Ronald Trist & Co., Ltd. ("Mobrey" magnetic level switches, "Electricon" smoke density indicators, feed water regulators, etc.).

Animals and Machines

DURING recent years much investigation has been made into the nature and behaviour of the central nervous system of animals, and particularly of human beings. The control and communication functions performed by the central nervous system are similar in principle to those exercised by operators of machines and comparisons between the two systems have enabled mathematical methods to be applied over a wide range of scientific types. In engineering, design has been aided, giving improvements in methods and efficiency.

On Tuesday last a paper on this subject was presented before the London Students' Section of the Institution of Electrical Engineers by Mr. B. Z. de Ferranti. After comparing control and communication in machines and animals, he discussed Wiener's book "Cybernetics" in some detail. He then passed on to control, learning, information and computers. The investigations outlined in the paper show how apparently unrelated fields have come together and how man is now combining the highest functions of animals with the latest technology of machines. This has been made possible by the growing knowledge of information and its function in control and communication.

The Tensor Club

MATRIX and tensor analysis mathematical techniques in their application to problems in electrical engineering were first brought to the notice of the engineer in a systematic form by Gabriel Kron of the American General Electric Co. World-wide interest has been shown in these new methods and in an endeavour to increase their use in the applied sciences the Tensor Club of Great Britain was formed in 1950.

The primary object of the club is to enable each member to keep the others informed of the work he is doing, or proposing to do, on determinants, matrices, vectors, dyadics and tensors. It also provides a channel for the exchange of ideas on the methods and their application to the solution of engineering and associated problems. Particulars are available from the joint organizers, Mr. S. Austen Stigant, 7, Courtlands Avenue, Hayes, Kent, and Dr. W. J. Gibbs, 53, Hillmorton Road, Rugby.

Gas Turbine Corrosion

THE effects of vanadium on gas turbine fouling and corrosion are given in a paper by Messrs. S. H. Frederick and T. F. Eden (Pametrada Research Station) which has been published by the Institution of Mechanical Engineers. Laboratory tests are said to have shown that no commercial alloy is immune from attack at above 650 deg C, the molten ash temperature. Nickel base alloys of the nimonic type offer higher resistance to attack than do austenitic steels and some protection is afforded by electro-deposited chromium coatings. Steels and heat resisting alloys are not appreciably attacked below the melting point of the ash but copper base alloys suffer considerable corrosion down to 500 deg C. Additives that accelerate or reduce the extent of corrosion are described.

ELECTRICITY SUPPLY

Purchase Tax on Heating Appliances

Analysis of Sales in October

THE Midlands Electricity Consultative Council at its meeting last week decided to press the Electricity Board to campaign for a reduction of the purchase tax on electrical appliances. The heavier tax on electric heating appliances compared with gas and oil equipment was understandable when the country was short of fuel and trying to save electricity, but it was not justified now that the Board was trying to encourage people to use electricity. Councillor H. Clowes of Stoke-on-Trent said that if the purchase tax was taken off electrical goods it would not only help the housewife, but would tend to increase the consumption of electricity and possibly lower the price.

The M.E.B.'s £83,433 loss on the sale of electrical fittings last year also worried the Council members and Councillor H. Goodwin Leek wondered whether the Board should continue selling fittings. The chairman, Mr. R. M. Barrow, pointed out that there had been a profit in the preceding five years. Last year's loss was due largely to a recession of trade and was also affected by restrictions on credit sales.

Village Supply

The oldest inhabitant of Reach, Cambs, 84-year-old Mrs. Badcock, switched on the village's new electricity supply when it was formally inaugurated recently. When the switch was operated a 6ft sign of red, white and blue lamps forming the words "Welcome to E.E.B." was illuminated. Lieut. Col. A. E. Knights, manager of the Fens Sub-Area of the Eastern Electricity Board, said that the supplying of power to the village was part of the Board's ten-year plan.

House Service Delays

Gateshead Town Council has set up a permanent committee to investigate delays in supplying water and electricity to new houses. A number of houses have been completed, but cannot be occupied because neither water nor electricity has been laid on.

Electricity for Children's Homes

The London Electricity Consultative Council recently requested the Board to give consideration to the application of the domestic all-in tariff to scattered homes for children and similar premises. At the last meeting of the Council it was reported that the Board had accepted the suggestion provided that the tariff was limited to premises not exceeding 4,000 sq ft in area based on the external dimensions of the premises.

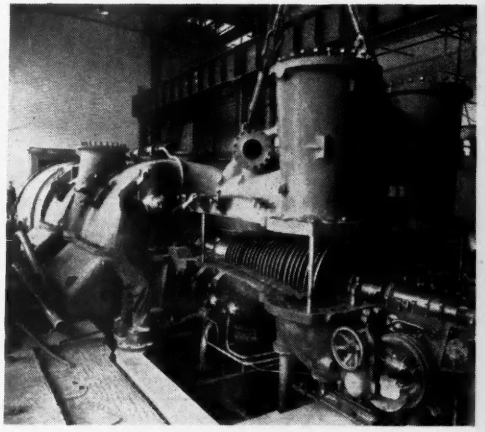
Assisted Wiring

Poplar General Purposes Committee is asking the Metropolitan Boroughs Standing Joint Committee to approach the London Electricity Board with a view to assisted wiring schemes being reintroduced. The Board maintains existing installations of this kind but has discontinued the scheme in respect of new installations because of the restrictions on capital investment.

Extensions at Huddersfield

A 30 MW turbo-alternator being installed at Huddersfield power station (see photograph) comprises the No. 3 extension at the station. The 5¾ ton high-pressure casing, one of several castings (total weight 16 tons) supplied by the

Lowering into position the high-pressure casing of a new 30 MW turbo-alternator at Huddersfield power station



David Brown Foundries Co., Penistone, was cast in David Brown Mk VIIIA chrome molybdenum steel, which specifies a yield point of 18 tons/sq in (minimum) and an ultimate tensile strength of 35 tons/sq in (minimum). These castings are designed for a steam pressure of 600 lb/sq in and a temperature of 850 deg F.

Electricity Boards' Sales

The accompanying table gives details of the amount of electricity sent out by the Area Boards for their consumers during October. The national figures show an increase over October, 1952, of 5 per cent, but when corrected for weather and the number of effective working days the increase is 7·4 per cent. The weather conditions were warmer and there were fewer effective working days than in October, 1952. In addition, reversion to G.M.T. came three weeks earlier this year than last.

Title of Consultative Council

At a meeting of the Midlands Electricity Consultative Council in Birmingham on 16th November, a resolution was passed that the name of the Council should be changed to "The Electricity Consumers' and Consultative Council." Councillor H. Preece (Wolverhampton) said that the change of title would help people to realize that the Council represents the interests of electricity consumers. Mr. E. G. Johnson (Ross-on-Wye) disliked both the present and proposed titles, but his proposed amendment that the title should be "Electricity Consumers' Council" was lost. The chairman, Mr. R. M. Barrow, said that a change of title might involve amending the Electricity Act. It was agreed that the matter should be referred to the next meeting of chairmen of Consultative Councils. The Council also passed a resolution calling for a more detailed explanation of the trading accounts of the Midlands Electricity Board in relation to contracting and the sale of fittings. A third resolution urged an approach to the Minister of Fuel on the question of purchase tax on electrical equipment.

Importance of Development

In the Taunton Sub-Area nearly half the new houses built so far this year have had electric cookers installed. This was stated last week by Mr. S. F. Steward, C.B.E., chairman of the South Western Electricity Board, when he presented the Area Challenge Cup to the Tiverton service centre team, winners of this year's service centre display competition. Congratulating the Tiverton team on their success, Mr. Steward stressed the need for "good shopkeeping" to encourage consumers to use to full advantage the services provided for them. The great expansion of electricity services involved heavy capital expenditure in generating plant, distribution lines and equipment.

Only a full use of electricity in the home and on the farm, to keep this capital equipment fully employed over a greater period each day, would enable the Board to continue this large-scale development and at the same time keep

ELECTRICITY SENT OUT BY AREA BOARDS FOR THEIR CONSUMERS

Area Board	Totals for October			Twelve Months Totals Ended 31st October		
	1952 Mill. kWh	1953 Mill. kWh	Increase or Decrease %	1952 Mill. kWh	1953 Mill. kWh	Increase or Decrease %
London	485·5	490·9	+ 0·5	5,280·6	5,684·4	+ 7·6
South Eastern	273·1	289·7	+ 6·1	3,047·1	3,339·9	+ 9·6
Southern	324·6	341·8	+ 5·3	3,542·5	3,910·5	+10·4
South Western	154·6	169·5	+ 9·6	1,712·2	1,888·9	+10·3
Eastern	453·7	472·8	+ 4·2	4,944·3	5,419·5	+ 9·6
East Midlands*	394·3	407·6	+ 3·4	4,253·5	4,620·7	+ 8·6
Midlands*	538·7	554·3	+ 2·9	5,824·9	6,128·0	+ 5·2
South Wales*	286·0	318·3	+11·3	3,235·9	3,413·4	+ 5·8
Merseyside & N. Wales*	289·7	304·7	+ 5·2	3,360·7	3,430·9	+ 2·1
Yorkshire*	524·7	540·5	+ 3·0	5,638·4	5,994·1	+ 6·3
North Eastern*	313·5	321·8	+ 2·6	3,479·7	3,604·4	+ 3·6
North Western*	564·1	608·2	+ 7·8	6,302·3	6,674·1	+ 5·9
South-East Scotland	109·4	115·5	+ 5·6	1,211·1	1,282·4	+ 5·9
South-West Scotland*	268·3	277·5	+ 3·4	2,912·9	3,098·8	+ 6·4
Total of all Area Boards	4,983·2	5,213·1	+ 4·6	54,746·1	58,490·0	+ 6·8
Direct Supplies by Central Authority	62·6	86·1	+37·5	721·9	921·1	+ 27·6
Grand Total	5,045·8	5,299·2	+ 5·0	55,468·0	59,411·1	+ 7·1
Mainly Industrial Areas*	3,179·3	3,332·9	+ 4·8	35,008·3	36,964·4	+ 5·6
Mainly Non-Industrial Areas	1,803·9	1,880·2	+ 4·2	19,737·8	21,525·6	+ 9·1
Total Number of Effective Working Days	28·66	28·32				

* Those in which industrial consumers took over 50% of the total sales in the preceding financial year.

down the cost of electricity. This was particularly the case in rural areas where capital and distribution costs were very high in relation to the low density and scattered nature of the population. The ultimate goal was to bring electricity within the reach of all but the most isolated premises and the service centre and sales staffs had a vital role to play in achieving this target. Mr. Steward quoted the case of a South West farmer who saved £51 a year in the cost of fuel and £29 in labour charges by changing over to electricity for steam raising in his dairy. To the home electricity had brought a higher standard of cleanliness and comfort at a lower cost than other fuels. "The use of a pennyworth of electricity means the substitution of one kilowatt-hour for ten housewife-hours of household drudgery," Mr. Steward said.

A Metropolitan-Vickers 86,700 kVA generator stator en route for Battersea "B" power station

Board Chairman Visits North Devon

During a visit to the Barnstaple District last week Mr. S. F. Steward, C.B.E., chairman of the South Western Electricity Board, met members of the staff at Lynton who are providing electricity supplies to premises in Lynmouth in parallel with the work of rebuilding there. His last visit to Lynton and Lynmouth was shortly after the flood disaster, when he saw the emergency work which had been carried out. Since then 108 premises have been provided with new supplies of electricity, most of them having been completely re-wired by the Board's Contracting Section in the Barnstaple District. Part of the sea defence construction work can be carried out only at periods of low tide, and the Board's staff have provided temporary lighting to enable this work to continue during the night.

Mr. Steward also visited Ilfracombe, where the staff have recently completed a major d.c. to a.c. conversion scheme. The work has included the erection of a 33 kV transmission line from Barnstaple to Shields Tor, Ilfracombe, the installation of seven 11 kV substations and nearly 7,000 yards of 11 kV lines and cables.

Plant for Battersea "B" Station

An 86,700 kVA generator stator weighing 105 tons left the Trafford Park works of the Metropolitan-Vickers Electrical Co., Ltd., on 16th November, for Battersea "B" power station (B.E.A.). The two-axis 100,000 kW turbo-generator set, of which this stator will form part, is a duplicate of a Metropolitan-Vickers set installed at Battersea in 1943.

Deterioration of Cable Sheathing

When it was reported to the Seaham Urban District Council that about 70 yards of faulty electric cables had been discovered under certain footpaths, the North Eastern Electricity Board expressed the opinion that pit rubble used by the Council in making the footpaths had caused a chemical reaction which had resulted in a deterioration of the lead sheathing of the cables.

Canadian Consumption and Costs

Between 1939 and 1951, the Canadian Dominion Bureau of Statistics reports, the average annual bill for domestic electric service in Canada increased by only 60 per cent, to $43·25 from $26·97, exclusive of sales taxes, while the average annual consumption per customer rose by nearly 84 per cent, to 2,617 kWh from 1,423 kWh.

American Rural Electrification

The United States Rural Electrification Administration reports the connection of about 150,000 farms during the year ended 30th June last. This raised the number of electrified farms in the United States to 4,888,460, representing nearly 91 per cent of the country's total.

Victorian Commission's Surplus

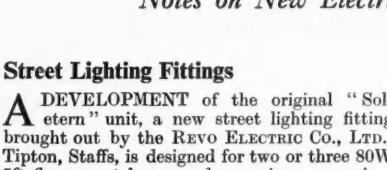
A net surplus in excess of £300,000 is expected from the operations of the Victorian State Electricity Commission for the year ended 30th June last. Announcing this recently, Mr. R. A. Hunt, the Commission's chairman, said that the principal factor was the much greater output of the brown coal and water-power stations which made it possible to economize in expensive fuels.

RECENT INTRODUCTIONS

Notes on New Electrical and Allied Products

Street Lighting Fittings

A DEVELOPMENT of the original "Sol-etern" unit, a new street lighting fitting brought out by the REVO ELECTRIC CO., LTD., Tipton, Staffs, is designed for two or three 80W 5ft fluorescent lamps and comprises a one-piece



Revo "Sol-etern" street lighting fitting

canopy in sheet aluminium and a one-piece "Perspex" bowl hinged on one side and secured by toggle fasteners. The internal reflector assembly and gear tray hinges downwards to allow access to the control gear and bracket clamps. Spring loaded lampholders also facilitate easy lamp replacement.

Vertical Muffle Furnaces

For certain classes of work vertical muffle furnaces are preferable to the standard horizontal types and units in this category are now available from A.E.W., LTD., Imperial Works, High Street, Edgware, Middlesex.

The outer case is of sheet steel with angle rings top and bottom, while the type of door depends upon the size of furnace and class of work for which it is to be used. The furnace chamber is built of high grade refractory bars which are grooved to support the elements. These are of 80/20 nickel chrome or "Kanthal A1" wire and are easily replaced without dismantling the furnace. The chamber is insulated from the outer case by refractory material.

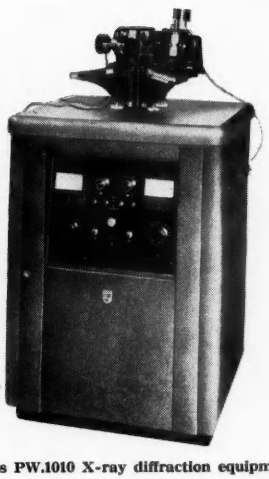
The temperature is governed by an automatic controller or energy regulator and pyrometer. Vertical furnaces are available for temperature ranges up to 1,050 deg C or 1,250 deg C.

A.E.W. vertical muffle furnace

X-Ray Diffraction Equipment

A new X-ray diffraction unit which is claimed to cover the immediate as well as long term needs in this field has been introduced by PHILIPS ELECTRICAL LTD., Century House, Shaftesbury Avenue, London, W.C.2.

Known as the PW.1010, it uses a system of interchangeable "sealed-off" X-ray tubes with different anode materials and having high-



Philips PW.1010 X-ray diffraction equipmen

transmission mica beryllium windows. A separate and continuously operated vacuum system is thus unnecessary. The equipment has only to be switched on and it is ready for use. The h.v. generator uses a single thoriated tungsten filament valve and the smoothed d.c. output is stabilized electronically to within 0·1 per cent. Variations in mains voltage up to ±10 per cent are compensated for automatically. The stabilization is unaffected by frequency drift. Each working position on the camera table is provided with an electromagnetically operated shutter controllable manually or by built-in time switches. A comprehensive system of interlocks guards against mishaps resulting from failure of mains or water supplies and incorrect handling. The PW.1010 is offered with a wide range of precision cameras although any type of camera can be used, including a Weissenberg goniometer. Thus, provision is made for the X-ray tube to be used either vertically or horizontally or by means of a cable, away from the unit altogether. The high degree of stabilization makes the PW.1010 particularly suited to Geiger counter spectrometry with or without an automatic recorder. The equipment is stated to comply with the recommendations of the International Commission on X-ray Protection.

Reflector Fire

The "Davey" reflector fire now being produced by A. D. DAVIDSON ELECTRIC CO., 62, Granville Street, Birmingham, 1, is of sturdy construction and attractive appearance. The reflector is polished chrome on brass and the sides are of chromium plated brass angle section. Available in two models, 1 kW (F.220) and 2 kW (F.221), each fire is fitted with a guard to conform to the safety regulations and is supplied complete with two yards of three-core flex. The 1 kW model measures 11½in high by 13in wide by 9in deep and weighs 4½ lb and the 2 kW model is 1in greater in height and weighs 1 lb more. Retail prices are £2 11s 6d (F.220) and £3 16s, plus £1 8s 3d and £2 1s 8d respectively purchase tax in the United Kingdom.

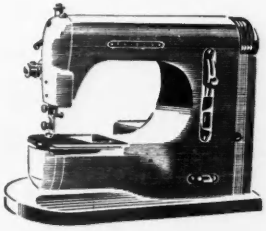
Time Measurement

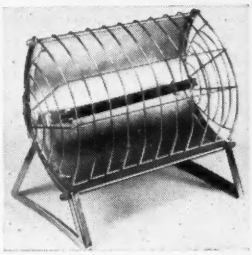
The sole manufacturing rights of a patented elapsed time indicator, held by P.S.B. Instruments, Ltd., have been assigned to CASS & PHILLIP, LTD., Hemel Hempstead, Hertfordshire. Distribution and all export sales continue to be handled by P.S.B. INSTRUMENTS, LTD., 75, George Street, London, W.1. This instrument, which is for indicating the operating time of vehicles and other devices, has a main dial scaled in 60 minute divisions and also two cyclometer counters registering "trip" and "total" hours respectively. A resetting knob at the bottom of the case can be pushed backwards to return the "trip" hours counter and minute hand to zero as required. The instrument may be operated from a battery or any other available source of electricity supply so that it can be used to register the hours of operation of petrol or battery industrial trucks or any form of handling equipment using electrical power.

Cass & Phillip elapsed time indicator

Electric Sewing Machine

Of combined Swiss-Dutch manufacture, the "Fridor" electric sewing machine now being distributed in this country by G-A DISTRIBUTORS, 29, Whitehall, London, S.W.1, can be used for all kinds of needlework and darning in addition to normal sewing. There are also facilities for darning socks, etc., by means of the "Fridor" darning arm. It is supplied with a slip-on work table that can be put on the darning arm for handling larger articles. A 6 V built-in light and a knee-operated speed control are fitted. The sewing machine is finished in green and supplied in a leather carrying case. The machine, including case, retails at £49 4s 6d, plus £9 11s 6d purchase tax in the United Kingdom.





Above: **"Fridor" electric sewing machine**
Below: **"Davey" model F.220 reflector fire**

Financial Section

STOCKS and SHARES

STOCK Exchange markets have developed a decidedly subdued air, in contrast with the high activity which prevailed for several months up to the early part of November. The damper was furnished by developments connected with the engineering wages dispute, and with the serious possibilities which this raised, in conjunction with what Mr. Butler describes as the "stickiness" of exports. These problems intruded themselves at a moment when markets seemed due in any case for a period of consolidation. Company dividends and earnings declarations continue to encourage confidence in others still to come, but many share prices had risen to levels which go at least some way towards discounting them.

Crompton Parkinson Accounts

Crompton Parkinson 5s shares, at 15s 6d, have retained the sharp rise in price which followed, earlier this month, the declaration of an increase in the annual distribution to 20 per cent. Confirmation is available, in the full accounts now published, of the satisfactory extent to which earnings expanded in providing the basis for this first change in the dividend rate for a decade. The payment is declared as a 12½ per cent dividend, plus 7½ per cent as bonus, the rate of which, says the chairman, can be varied with the fortunes of the company. A feature of the balance sheet is the reduction of more than £2 million in the overdraft and a greatly improved state of liquidity.

S. Smith (England)

The 4s shares of S. Smith & Sons (England) reacted well, rising from 9s 9d to 10s 6d, to news of the increase in the dividend from a total of 12½ to 15 per cent, and to excellent figures in the preliminary profits statement. Net profits of the group at £566,000 are some 30 per cent up on last year's, despite much larger tax provisions. Included in the latter is an amount of £160,000 on account of excess profits levy. This in itself takes a larger share of the surplus than does the net ordinary dividend amounting to £147,000, and it is, of course, due for extinction at the end of this year. Allowing for the dividend, which will by now have been deducted from the price, the shares offer a yield of over 5¾ per cent.

New Issues

The premium on Reyrolle new ordinary shares, offered to shareholders at 40s, went back to 22s 6d, in accordance with the depressing influence often exerted on these occasions by the selling of "rights." C. A. Parsons new shares are also lower at a premium of 13s 9d on the issue price of 22s 6d. English Electric are to hold a meeting next Thursday (3rd December) to approve the proposed 50 per cent capital bonus. The Taylor Tunnicliff issue of bonus shares on a one-for-one basis comes up for approval a week later. Ultra Electric new 5s shares, offered to stockholders at 5s 6d, are quoted at 9s.

Enfield Cables

An announcement from Enfield Cables, Ltd., to the effect that no interim dividend is to be paid for the current year, came to the market as a disappointment, the effect of which was to lower the price of the £1 shares from 23s to 18s 9d. At this time last year, an interim of 2 per cent was declared, to be followed in due course by a final of 3 per cent. An explanatory statement indicates that losses sustained by the rubber manufacturing subsidiary may absorb most of the year's profits on the cable business, which is contending with difficult conditions. Dividend considerations are consequently being postponed until the results for the full year are known.

Morphy-Richards

The chairman of Morphy-Richards, speaking at last week's annual meeting, attributed much of the improvement in group earnings during the latest year to a larger contribution from the Canadian subsidiary. Net profits, after tax, came out some £20,000 higher at £66,600, of which more than half is being retained in the business after the distribution of ordinary dividends totalling 40 per cent. This is the rate (or its equivalent) paid in each year since the company was made public in 1947. Quoted at 16s, the 4s shares offer a yield of 10 per cent on that basis.

Price Changes

A rise in Ericsson Telephones to 46s 6d stood out in the electrical equipment market. Lancashire Dynamos changed hands at 47s, against the official quotation of 44s 3d. Hackbridge & Hewittic, Hall Telephone and Plessey were up by 6d each. On the other tack, Tube Investments, still under the influence of the dividend disappointment, were marked down further to 61s. Chloride Electricals were quoted at 42s ex the 100 per cent share bonus. The volatile Telephone Properties went down by 3s 9d to £6 pending developments. United Steel Companies' shares went back to 3d discount on the issue price of 25s.

ELECTRICAL INVESTMENTS

Past Week's Price Changes

Company	Dividend Previous	Dividend Last	Middle Price 23rd Nov. 1953	Week's Rise or Fall	Est. Yield p.c.
Gilt-edged and Overseas Stocks			£ s d		
Brit. Elec. 1968/73	3	3	89½	−½	3 7 0
Brit. Elec. 1974/77	3	3	89	—	3 7 5
Brit. Elec. 1976/79	3½	3½	94	—	3 14 6
Brit. Elec. 1974/79	4¼	4¼	104	+½	4 1 9
Calcutta Elec. ..	6†	6†	19/-	—	6 6 4†
East African Power	7	7	22/-	—	6 7 3
Nigerian Elec. ..	10	10	24/6	+1/-	8 3 4
Palestine Elec. "A"	5†	Nil	18/-	+6d	Nil
Perak Hydro-Elec.	Nil	6	15/6	—	7 15 6
Equipment and Manufacturing					
Aberdare Cables (5/-)	20	25	8/6	—	7 7 0*
Aerialite (1/-) ..	83½	88½	10/-	—	8 16 8
Allen, W. H. ..	15	15	50/-	—	6 0 0
Aron Elec. Ord. ..	15	20	42/6	—	9 8 2
Assoc. Elec. Ord.	20	20	42/6	—	4 14 3*
Automatic Tel. & El.	15	15	63/9	—	4 14 1
Babcock & Wilcox	18	18	47/-	−9d	—
Baldwin, H. J. (2/-)	20	20	4/-	—	10 0 0
Bakelite (10/-) ..	—	12½	24/-	—	5 4 3
British Aluminium	12	12	37/6	−1/9	6 8 0
B.I. Callender's ..	9	10	39/6	−6d	5 1 3
British Thermostat (5/-) ..	30	35	18/9	—	—
British Vac. Cleaner (5/-) ..	25	25	12/9	−6d	9 16 0
Brook Motors (10/-)	20	20*	35/-	—	5 14 3
Brush Ord. (5/-) ..	10	4	4/3	—	—
A. F. Bulgin (1/-)	30	30	3/3	—	9 4 6
Burco (5/-) ..	35	35	23/9	—	7 7 4
Chloride El. Storage	15	20	42/-xb	—	4 15 3*
Cole, E. K. (5/-) ..	25	25*	20/6	—	6 2 0
Cossor, A. C. (5/-)	10	10	7/3	—	6 18 0
Crabtree (10/-) ..	17½	17½	26/-	—	6 14 6
Crompton Parkinson Ord. (5/-) ..	11½	20	15/6	—	6 9 0
De La Rue (5/-) ..	35	Nil	12/-	−9d	—
Decca (5/-) ..	112½	150	34/-	—	4 8 3*
Dewhurst (2/-) ..	22½	19*	6/3	+9d	6 1 6
DictographTel.(2/-)	20	20*	5/9	—	6 19 3
E.M.I. (10/-) ..	12	8	13/-	−3d	6 3 1
Electrical Components (5/-) ..	20	20	11/-	+3d	9 1 10
Elec. Construction	15	15	53/9	—	5 11 9
Enfield Cable Ord.	7½	5	18/9	−4/3	5 6 8
English Electric ..	15	15	60/-	—	5 0 0
Ericsson Tel. (5/-)	22†	22*†	46/6	+4/6	2 7 6†
Ever Ready (5/-) ..	35	35	28/6	—	6 2 10
Falk Stadelmann	15	15	42/6	—	7 1 3
G.E.C. Ord. ..	22½	11½*	40/-	—	5 12 6
General Cables (5/-)	30	30	16/9	—	8 19 2
Greenwood & Batley	15	17½	40/9	—	8 11 9
Hackbridge Cable (5/-)	20	20	12/9	—	7 17 0
Hackbridge Hewittic (5/-)	20	20	18/6	+6d	5 8 0
Hall Tel. Acc.(10/-)	10	10	12/-	+6d	8 6 8
Hewtrae (2/-) ..	12½	12½	4/-	—	6 5 0
Henleys (10/-) ..	20	10½*	17/6	—	6 0 0
Hellophane (5/-) ..	20	20	12/6	—	8 0 0
Hoover (5/-) ..	35	25	25/3	−6d	4 19 0

Company	Dividend Previous	Dividend Last	Middle Price 23rd Nov. 1953	Week's Rise or Fall	Est. Yield p.c.
Equipment and Manufacturing (continued)			£ s d		
Intl. Combustion (5/-)	25	15*	15/-	—	5 0 0
Johnson & Phillips	15	15	51/6	—	5 16 6
Lancashire Dynamo	12½	12½	44/3	—	5 13 0
Laurence, Scott (5/-)	15	15	14/3	—	5 5 3
London Elec. Wire	12½	15	75/9	—	3 19 3
J. Lucas	9⅜	10⅝	47/6	—	4 11 3
Marryat & S. (2/-)	22½	22½	5/9	—	7 16 6
Mather & Platt ..	12½	15	53/6	+6d	5 12 3
Metal Industries ..	15	12*	38/9	−1/9	6 3 4
Mid. Elec. Mfg. ..	15	15	61/3	—	4 18 0
Murex	15	15	53/-	—	5 13 3
Newman Ind. (2/-)	10	10	2/6	—	8 0 0
Oldham & Son (1/-)	35	17½*	2/6	—	7 0 0
Parnall (Yate) (5/-)	6	6	3/10½	—	7 14 10
Parsons, C. A. ..	10*	12½	36/3	−1/6	—
Plessey (5/-) ..	25	30	31/3	+6d	4 16 0
Pye Deferred (5/-)	18	20	21/-	—	4 15 3
Revo (10/-) ..	27½	27½	17/6	—	—
Reyrolle	10*	12½	62/6	−6d	—
Scot. Cable (4/-) ..	32	20*	13/-	—	6 3 0
Siemens Ord. ..	10	10	36/-	−6d	5 11 1
Southern Areas ..	5	6	18/-	—	6 13 4
Strand Elec. (5/-) ..	17½	17½	7/9	—	11 5 6
Sturtevant (5/-) ..	17½†	18·1*†	29/-	—	—
Sun Elec.	15	15	25/-	—	12 0 0
Switchgear & Cowans (5/-)	22½	22½	13/9	—	8 3 0
Taylor, T. (5/-) ..	20	25	22/6	—	5 11 0
T.C.C. (10/-) ..	20	20*	42/6	—	—
T.C. & M. ..	10	8½*	28/6	−6d	5 19 4
Telephone Mfg. (5/-)	10	10	7/9	—	6 9 0
Thorn Elec. (5/-) ..	10	12½	13/-	—	4 16 2
Tube Investments	15*	15	61/-	−3/-	4 18 3
Vactric (5/-) ..	Nil	Nil	10/-	—	—
Veritys (5/-) ..	7½	10	4/6	—	11 2 2
Walsall Conduits (4/-)	70	70*	45/-	—	6 4 6
Ward & Goldstone (5/-)	45	45*	44/6	−1/-	5 1 2
Watford (2/-) ..	25	25	5/3	—	—
Westinghouse Brake	14	15	62/6	—	4 16 0
West, Allen (5/-) ..	15	15	13/3	—	5 13 2
Trusts, Transport and Communications					
Anglo-Am. Tel.: A. Ord.	—	6	86½	—	6 18 9
Ord.	—	3⅜	57½	—	6 10 5
Anglo-Portuguese	8	8	22/3	−6d	7 3 9
Brit. Elec. Traction: Def. Ord. (5/-) ..	25	35	36/6	+6d	4 16 0
Cable & Wireless: Ord.	8	8	146	—	5 9 7
4% Loan ..	4	4	97	—	4 2 6
Calcutta Trams ..	6†	2½†	18/9	—	—
Cape Elec. Trams	5½	5½	10/-	—	11 0 0
Marconi Marine ..	10	10	28/9	—	6 19 2
Oriental Tel. Ord.	16	16	72/6	—	—
Telephone Props.	8	8	6	−⅛	—
Tele. Rentals (5/-)	10	10*	10/-	—	5 0 0

* After capital bonus. † Dividends are paid free of income tax.

The above quotations are based upon the middle prices given in the Stock Exchange Daily Official List.

REPORTS and DIVIDENDS

Crompton Parkinson, Ltd.—The report and accounts now issued confirm the figures given in our issue of 6th November.

In his accompanying statement, Mr. A. Parkinson (chairman) says that the decline in demand to which he referred a year ago continued, intensified and extended in scope to almost all their products, and in parallel with this recession, the productivity and efficiency of their operations increased, with the result that the pool of orders in hand has been considerably reduced during the year. In most sections of the business the recession of demand had ceased by the end of the year and in some sections there has been a modest recovery. The reduction in demand also affected their suppliers with the beneficial result that materials and parts became more readily available, thus enabling them to effect both a reduction and a better balance in their stocks, which, in turn, largely contributed to their improved productivity and efficiency and at the same time reacted favourably on their liquid position.

The year under review has seen, in its early part, some of the worst effects of the almost world-wide economic adjustments of about eighteen months ago, and their aftermath, and, in later months, a welcome turn of the tide. Economic stability, however, has not been achieved in any of their important overseas markets. They have continued their policy of close personal contact by visits to many parts of the world. The manufacturing operations of their overseas factories have been further developed during the year. They started the current financial year with a total order book less than at the beginning of the previous year and in some sections of the business it was deplorably small. Similar difficulties are being experienced throughout the electrical industry and in consequence order getting has become a more formidable task. On the other hand the flow of orders has recently improved and the average efficiency of their manufacturing and marketing operations is greater than ever. Although world trading conditions are still difficult, the past twelve months have seen international changes of some significance and they feel the prospects of a return to normal conditions of trade are better than they have been for many years past.

Smith & Sons (England), Ltd., report consolidated profits for the year ended 1st August last of £1,678,279, as compared with £1,243,229 for 1951-52, and after deducting £1,112,161 for taxation, there is a balance of £566,118 (against £433,832). To this is added tax provisions no longer required, making a group net profit of £819,201 (£619,252), of which £520,813 (£408,075) is attributable to the parent company. It is proposed to pay a final ordinary dividend of 12½ per cent (against 10 per cent), making 15 per cent for the year (against 12½ per cent).

Brook Motors, Ltd.—The accounts for the year to 30th September last show a group profit of £401,844, as compared with £682,950 for the preceding year, and after providing £234,549 for taxation, the net profit is £107,495 (against £243,491). It is proposed to pay a final ordinary dividend of 15 per cent, again making 20 per cent for the year. The final dividend is paid on larger capital.

Enfield Cables, Ltd., announces that it has decided not to pay an interim ordinary dividend. The directors consider it more prudent to await the results for the full financial year before considering dividend policy. As was foreshadowed in the chairman's speech at the last annual general meeting, cable business has been difficult by reason of the falling off in orders and reductions in profit margins. At the same time there has been little reduction in the rate of loss at Brynmawr Rubber, Ltd., in spite of an improvement in output and in the quality of the goods produced. The Brynmawr loss may absorb the greater part of the profit on the cable business for the year to 31st December next.

Aberdare Cables Africa, Ltd., in its report for the year to 30th June last shows a trading profit of £265,854, as compared with £257,723 for the previous year, and after deducting taxation of £78,000, the net profit is £187,854 (against £182,423). Sums totalling £110,000 are allocated to various reserves, and, as already announced, the ordinary dividend for the year is maintained at 15 per cent.

The Electric Furnace Co., Ltd., has declared an interim dividend of 3½ per cent (against 5½ per cent) on doubled capital.

New Companies

John Buzzard, Ltd.—Registered 30th October. Capital £3,000. Manufacturers, repairers and hirers of and dealers in electrical and mechanical apparatus and accessories and in particular radio sets, etc. Directors : J. D. Buzzard and Mrs. Mary A. Buzzard. Regd. office : 1-2, Church Lane, Banbury, Oxon.

Rahvey, Ltd.—Registered 17th October. Capital £1,000. Electrical, radio and general engineers, etc. The first directors are to be appointed by the subscribers.

E.M.S. Electrical Products, Ltd – Registered 2nd November. Capital £100. Manufacturers and fabricators of and wholesale and retail dealers in electrical goods and

materials of all kinds, etc. Directors : J. M. Hollander and G. Lockwood. Regd. office : 28-32, The Butts, Coventry.

A. H. Baker & Co., Ltd.—Registered 6th November. Capital £100. Electrical engineers and contractors, radio and television engineers, etc. Directors : A. H. Baker, Mrs. Florence A. Baker and W. A. Fenwick. Regd. office : 69, Grenfell Avenue, Hornchurch, Essex.

Goblin Electric Appliances, Ltd.—Registered 4th November. Capital £10,000. Directors : J. J. Hambidge and M. Johnston, joint managing directors of British Vacuum Cleaner & Engineering Co., Ltd. Secretary : R. C. Hobson. Solicitors : Linklaters & Paines, 6, Austin Friars, E.C.2. Regd. office : Goblin Works, Leatherhead, Surrey.

C. Larter & Co., Ltd.—Registered 3rd November. Capital £200. Electrical engineers and contractors, etc. Directors : A. M. Fernandes and C. S. Larter. Secretary : A. M. Fernandes. Regd. office : 120, Heath Road, Twickenham, Middx.

R.C.S. Products (Radio), Ltd.—Registered 7th November. Capital £500. Directors : E. E. Stone and R. F. Thompson. Regd. office : Ranch House, Spellbrook Lane, Spellbrook, near Sawbridgeworth, Herts.

Liquidations

D. Airley & Co., Ltd., radio, television and electrical retailers and contractors.—Winding up voluntarily. Liquidator, Mr. P. H. Owen, Stafford Chambers, 14, Brown Street, Manchester, 2, appointed 12th November.

Vickery & Bowker (Holcombe Brook), Ltd., electrical engineers and radio dealers.—Winding up voluntarily. Liquidator, Mr. R. F. Bendall, 31, Lloyd Street, Manchester, 2.

Avery Ward & Co., Ltd., manufacturers of electric light fittings.—Winding up voluntarily. Liquidator, Mr. L. W. Loryman, Rex House, 38, King William Street, London, E.C.4, appointed 14th November. Particulars of claims to the liquidator by 16th December.

Bankruptcies

J. L. R. Mack, lately residing at and carrying on business at 5, Priory Road, Tonbridge, Kent, as a radio, television and electrical engineer.—Receiving order made 13th November on a creditor's petition.

F. Phillips, 28, Blenheim Terrace, St. John's Wood, N.W.8, electrical contractor, and lately trading at this address as F. Phillips & Son, electrical contractors.—Trustee, Mr. F. H. Langmaid, Bankruptcy Buildings, Carey Street, London, W.C.2, Official Receiver, released 12th November, 1953.

M. Tilley, carrying on business at 13, Shakespeare Street, Newcastle-upon-Tyne, as an electrical and radio wholesaler as Hawkins, Tilley & Co.—Last day for receiving proofs for dividend 2nd December. Trustee, Mr. R. F. Howe, Clarendon House, Clayton Street West, Newcastle-upon-Tyne, 1, Official Receiver.

J. Jevons, 187, Wolverhampton Street, Dudley, Worcs, radio, television and electrical engineer, trading as "R.E.C. Stores."—Receiving order made 14th November on debtor's own petition.

W. H. Collis, 59, King Street, Fenton, Stoke-on-Trent, electrical engineer.—Order made 22nd October suspending bankrupt's discharge for six weeks, and that he be discharged as from 4th December.

L. Peel, of, and lately carrying on business at, 216, Low Lane, Horsforth, near Leeds, electrical engineer.—Last day for receiving proofs for dividend 5th December. Trustee, Mr. W. H. Meredith, 29, East Parade, Leeds, 1, Official Receiver.

I. F. Berners and **C. J. Berners,** trading as Major Manufacturing Co., 98, Great Tower Street, London, E.C, battery manufacturers.—Supplemental dividend of 1s in the £, payable on and after 3rd December at Bankruptcy Buildings, Carey Street, London, W.C.2.

F. L. Napier, 5, School Road, Sale, Ches, electrical contractor.—First and final dividend of 6s 2d in the £, payable at 47, Mosley Street, Manchester.

TRADE MARKS

APPLICATIONS have been made for the registration of the following trade marks. Objections may be entered up to 18th December:—

GELOSO (design). No. 715,118, Class 9. Parts and fittings included in Class 9 of radio apparatus; and magnetophones and gramophone turntables.—Societa per Azioni Geloso, Milan, Italy. Address for service, c/o Boult, Wade & Tennant, 111–112, Hatton Garden, London, E.C.1.

GILFLEX. No. 718,936, Class 9. Electric wiring conduits made from flexible non-metallic tubing.—Gilflex Conduits, Ltd., 41, The Parade, High Street, Watford, Herts.

CIPEL. No. 719,974, Class 9. Electric cells, batteries and accumulators, parts and fittings, all included in Class 9. — Compagnie Industrielle des Piles Electriques (C.I.P.E.L.), Neuilly-sur-Seine, France. Address for service, c/o D. Young & Co., 29, Southampton Buildings, Chancery Lane, London, W.C.2.

MICROVOX. No. 721,818, Class 9. Electronic sound recording and sound reproducing apparatus and instruments and parts and fittings included in Class 9.—G. Kingsley, trading as Dictating Machine Co., 32, Victoria Street, London, S.W.1.

LIFELINE. No. 722,771, Class 9. Radio apparatus.—W.N.A., Ltd., 81, Chester Square, Westminster, London, S.W.1.

SILVER-SWAN (design). No. B721,497, Class 11. Electric lamps included in Class 11.—Edison Swan Electric Co., Ltd., 155, Charing Cross Road, London, W.C.2.

MYCALON. No. 722,063, Class 17. Moulded electrical insulating materials.—Mycalex Co., Ltd., Ashcroft Road, Cirencester, Glos.

NEXT WEEK'S EVENTS

Organizers of electrical functions are advised to make use of the* Electrical Review *clearing house, Room 231, Dorset House, Stamford Street, London, S.E.1, to ascertain that proposed dates for their functions do not clash with others already arranged

Monday, 30th November

BIRMINGHAM.—Town Hall, 6 p.m. I.E.E. South Midland Centre. Faraday Lecture, "Process Heating," by O. W. Humphreys.

LEEDS.—The University, 7.30 p.m. Incorporated Plant Engineers, West and East Yorks Branch. "Some Recent Applications of Electronics in Industry," by R. H. Wheat.

LONDON.—Savoy Place, 6.30 p.m. I.E.E. Radio Section. Section Soirée.

Caxton Hall, S.W.1, 7 p.m. Electrical Power Engineers' Association, London Local Group. Discussion on "Transmission and Distribution Problems," opened by F. J. Lane.

READING.—George Hotel, 7.15 p.m. Institution of Electrical Engineers, District meeting. "Sound Recording," by Dr. G. F. Dutton.

Tuesday, 1st December

BRADFORD.—Y.E.B., Sunbridge Road, 6.30 p.m. I.E.E. North Midland Students' Section. "The Application of R.F. Heating in the Textile Industry," by A. R. Bailey.

CAMBRIDGE.—Cavendish Laboratory, 8.15 p.m. I.E.E. Cambridge Radio Group. "Electronics in Aircraft."

COVENTRY.—Technical College, 7.30 p.m. Institution of Engineering Inspection, Coventry Branch. "Modern Developments of Mining Machinery," by H. Entwistle and D. Creeth.

EDINBURGH.—Carlton Hotel, North Bridge, 7 p.m. I.E.E. South-East Scotland Sub-Centre. "Special Effects for Television Studio Productions," by A. M. Spooner and T. Worswick.

ELTHAM.—At the Congregational Church, Court Road, 8 p.m. A.S.E.E. South-East London Branch. "Relays and Associated Equipment."

LONDON.—Savoy Place, 5.30 p.m. I.E.E. Measurements Section. Discussion on "The Influence of Legislation on the Costs of Metering," opened by S. Howarth.

At the Royal Society of Arts, John Adam Street, Adelphi, Strand, 7 p.m. Incorporated Plant Engineers, London Branch. "The Financial Implication of Plant Installation," by H. L. Layton.

29, King Street, W.C.2, 7.30 p.m. A.S.E.E. West London Branch. "Coloured Directional Light as Applied to the Stage," by L. G. Applebee and P. Rose.

MANCHESTER.—Engineers' Club, Albert Square, 7 p.m. I.E.E. North-Western Centre. "What is Philosophy?" by Prof. Dorothy M. Emmet and Sir Samuel Hall. (Lecture in co-operation with the Manchester University.)

SWANSEA.—University College, Singleton Park, 6.45 p.m. Institute of Metals, South Wales Local Section. "Metallurgical Research in the Electrical Industry," by Dr. I. Jenkins.

Wednesday, 2nd December

EDINBURGH.—12, Rothesay Place, 7 p.m. I.E.S. Edinburgh Centre. "Dimming of Fluorescent Tubes and Stage Lighting," by H. H. Ballin.

GLASGOW.—39, Elmbank Crescent, 7 p.m. I.E.E. South-West Scotland Sub-Centre. "Special Effects for Television Studio Productions," by A. M. Spooner and T. Worswick.

LONDON.—Savoy Place, 5.30 p.m. I.E.E. Radio Section. "Telegraph Codes and Code Convertors," by T. Hayton, C. J. Hughes and R. L. Saunders, and "Code Convertors for the Interconnection of Morse and Teleprinter Systems," by R. O. Carter and L. K. Wheeler.

Queen's Head, 677, Green Lanes, Harringay, 7.4 p.m. A.S.E.E. North London Branch. "Water Heaters."

MIDDLESBROUGH.—Cleveland Scientific and Technical Institute, 6.30 p.m. I.E.E. Tees-Side Sub-Centre. "Electrical Equipment of a Blooming Mill," by G. G. Nicholson.

NEWCASTLE-UPON-TYNE.—Roadway House, 8, Oxford Street, 6.15 p.m. I.E.S. Newcastle Centre. "Lighting for Enjoyment," by T. O. Freeth.

PORTSMOUTH.—Municipal College, 6.30 p.m. I.E.E. Southern Centre. "Design Features of Certain British Power Stations," by S. D. Whetman and A. E. Powell.

RUGBY.—College of Technology and Arts, 6.30 p.m. I.E.E. Rugby Sub-Centre. "The Technique and Development of Automatic Winding in Mine Shafts," by B. L. Metcalf and G. Cuttle.

SWANSEA.—Plaza Buildings, The Kingsway, 6.30 p.m. I.E.S. Swansea Group. "Sports Lighting."

Thursday, 3rd December

CARDIFF.—At the South Wales Institute of Engineers, Park Place, 6 p.m. Association of Mining Electrical and Mechanical Engineers, South Wales Branch. "History of Regulations in Mines," by J. Cowan.

CROYDON.—Café Royal, North End, 8 p.m. A.S.E.E. South London Branch. "Electrical Motor Application," by A. N. D. Kerr.

GLASGOW.—39, Elmbank Crescent, 6.30 p.m. I.E.S. Glasgow Centre. "Application of Dimming Fluorescent Tubes," by H. H. Ballin.

39, Elmbank Crescent, 7 p.m. British Institution of Radio Engineers, Scottish Section. "The B.B.C. Television O.B. Unit."

GLOUCESTER.—2, St. Aldate Street, 6.30 p.m. I.E.S. Gloucester and Cheltenham Centre. "Interior Decoration and its Influence on Lighting," by A. G. Ellis.

HULL.—Y.E.B. Ferensway, 7.15 p.m. I.E.E. North Midland Centre. "275 kV Developments on the British Grid System," by D. P. Sayers, Dr. J. S. Forrest and F. J. Lane.

LEICESTER.—De Montfort Hall, 7.15 p.m. I.E.E. East Midland Centre. Faraday Lecture on "Process Heating," by O. W. Humphreys.

Palais-de-Danse. E.I.B.A. East Midlands Area. Coronation Year ball.

LIVERPOOL.—Electricity Service Centre, Whitechapel, 7 p.m. British Institution of Radio Engineers, Merseyside Section. Discussion on "Education in the Radio and Electronics Industry."

Exchange Hotel. Incorporated Plant Engineers, Merseyside and North Wales Branch. Annual dinner and dance.

LONDON.—Savoy Place, 5.30 p.m. Institution of Electrical Engineers. "Technical Arrangements for the Sound and Television Broadcasts of the Coronation Ceremonies on 2nd June, 1953," by W. S. Procter, M. J. L. Pulling and F. Williams.

MANCHESTER.—College of Technology, 7 p.m. British Institution of Radio Engineers, North Western Section. "The Monitoring of High Speed Waveforms, Using a Sampling Technique," by J. MacQueen.

NOTTINGHAM.—E.M.E.B. Smithy Row, 6 p.m. I.E.S. Nottingham Centre. "Some Problems in Railway Lighting," by E. Morgan.

Friday, 4th December

BIRMINGHAM.—Imperial Hotel. E.I.B.A. Birmingham Branch. Annual general meeting, preceded by a luncheon.

"Regent House," St. Phillip's Place, Colmore Row, 6 p.m. I.E.S. Birmingham Centre. "Illuminated Signs," by E. E. Faraday and E. F. Martin.

LIVERPOOL.—9, The Temple, Dale Street, 7.30 p.m. A.S.E.E. Liverpool Branch. "Ductube Pneumatic Tubing," by H. F. Huggins.

LONDON.—Storey's Gate, St. James's Park, S.W.1, 5.30 p.m. Institution of Mechanical Engineers. "Comparative High Temperature Properties of British and American Steels," by W. B. Bardgett, and Dr. C. L. Clark, and "A Critical Examination of Procedure Used in Britain and the United States to Determine Creep Stresses for the Design of Power Plant for Long Life at High Temperatures," by R. W. Bailey.

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